PROJECT MANUAL

STATE STREET CAMPUS GARAGE MIXED-USE, PHASE 1

415 N. LAKE STREET
MADISON, WI 53715

CONSTRUCTION DOCUMENTS

milwaukee : 333 E Chicago St
madison : 309 W Johnson St, Ste 202
green bay : 124 N Broadway
denver : 1899 Wynkoop St, Ste 700
atlanta : 1401 Peachtree St NE, Ste 300

EUA PROJECT NUMBER: **720448**
BPW CONTRACT #: **9361**

DATE: 10-02-2023

VOLUME 1

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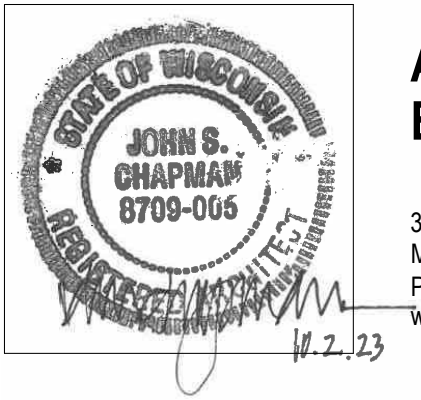
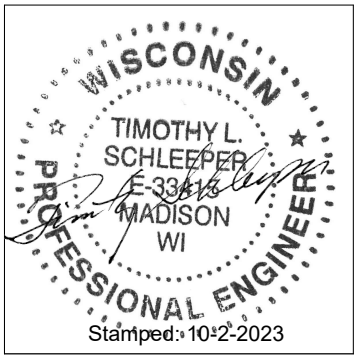
SECTION 00 01 07
SEALS PAGE



ARCHITECTURAL
EPPSTEIN UHEN ARCHITECTS, INC.

309 West Johnson Street, Suite 202
Madison, WI 53703
PHONE: 608.442.5350
www.eua.com

ARCHITECT: John Chapman
PROJECT CONTACT: Mike Oates , PM
DIRECT PHONE: (414) 298-2221
EMAIL ADDRESS: mikeo@eua.com



CIVIL
VIERBICHER ASSOCIATES, INC

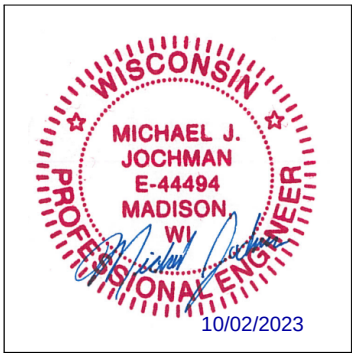
999 Fourier Dr # 201
Madison, WI 53717
PHONE: (608) 826-0532
www.vierbicher.com

PROJECT CONTACT: Timothy Schleeper , PE
DIRECT PHONE: (608) 821-3959
EMAIL ADDRESS: tsch@vierbicher.com

STRUCTURAL
PIERCE ENGINEERS, INC.

222 W Washington Ave #650
Madison, WI 53703
PHONE: (608) 256-7304
www.pierceengineers.com

PROJECT CONTACT: Lucas Marshall , PE
DIRECT PHONE: (608) 729-1414
EMAIL ADDRESS: lmarshall@pierceengineers.com



MECHANICAL
JDR ENGINEERING, INC.

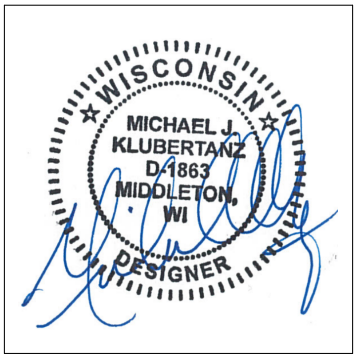
5525 Nobel Dr
Fitchburg, WI 53711
PHONE: (608) 277-1728
www.jdrengineering.com

PROJECT CONTACT: Michael Jochman
DIRECT PHONE: (608) 819-0193
EMAIL ADDRESS: jochman@jdreng.com

PLUMBING/FIRE PROTECTION
JDR ENGINEERING, INC.

5525 Nobel Dr
Fitchburg, WI 53711
PHONE: (608) 277-1728
www.jdrengineering.com

PROJECT CONTACT: Carlos Ruef
DIRECT PHONE: (608) 277-1728
EMAIL ADDRESS: ruef@jdreng.com



ELECTRICAL
JDR ENGINEERING, INC.

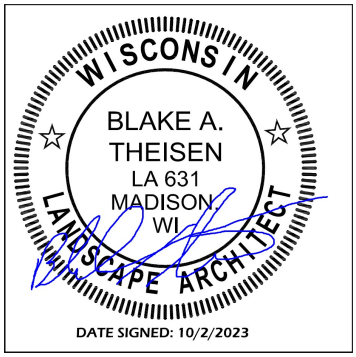
5525 Nobel Dr
Fitchburg, WI 53711
PHONE: (608) 277-1728
www.jdrengineering.com

PROJECT CONTACT: Michael Klubertanz
DIRECT PHONE: (608) 819-0175
EMAIL ADDRESS: klubertanz@jdreng.com

PARKING CONSULTANT
WALKER CONSULTANTS

6602 East 75th Street, Suite 210
Indianapolis, IN 46250
PHONE: (317) 842-6890
www.walkerconsultants.com

PROJECT CONTACT: Kyle Keppner
DIRECT PHONE: (317) 348-2244
EMAIL ADDRESS: kkeppner@walkerconsultants.com



LANDSCAPE ARCHITECT
PARKITECTURE

901 Deming Way, Suite 201
Madison, WI 53717
PHONE: (608) 203-8203
https://www.parkitecture.org/

PROJECT CONTACT: Blake Theisen
DIRECT PHONE: (608) 203-8203
EMAIL ADDRESS: blake@parkitecture.org

SECTION 00 01 10
TABLE OF CONTENTS

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SECTION 00 31 46
PERMITS

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.

B. State Statutes

C. Other Regulatory Regulations

D. 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 CONTRACTORS 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. Scheduling all required inspections that may be conditions of any required permits.
3. Paying for other permits not explicitly stated as excluded in this section.

B. The GC is not responsible for paying for the City Building, City HVAC, City Electrical, City Plumbing, Madison Fire Department Sprinkler and Madison Fire Department Fire Alarm permits.

C. 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

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 00 43 25
SUBSTITUTION REQUEST FORM (DURING BIDDING)

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 procedures in this specification shall apply to all proposals by Contractors, Suppliers, Vendors, and Manufacturers when the conditions in item 1.1.B. above have been met during the bidding phase.

1.2. RELATED SPECIFICATIONS

A. 01 25 13 Product Substitution Procedures

PART 2 – PRODUCTS – THIS SECTION NOT USED

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, Supplier, Vendor, or Manufacturer shall do all of the following:

1. Submit a Substitution Request Form for each different product. Use a printed/scanned copy of the form at the end of this specification as a cover sheet.
2. Support your request with complete data, drawings, specifications, performance data and samples as appropriate. A complete submission shall include the following:
   a. Substitution Request Form as a cover sheet
   b Comparison of qualities of the proposed substitutions with that specified.
   c. Changes required in other elements of the Work because of the substitution.
   d. Effect on the construction schedule.
   e. Cost data comparing the proposed substitution with the Product specified.
   f. Any required license fees or royalties.
   g. 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.
   a. Submissions to be done as complete PDF files for each product, appropriately titled
   b. 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.
      i. The subject line shall include the contract number and "Request for Substitution". Example: Contract 1234 – Request for Substitution
4. Submissions must be received by the substitution request deadline specified in Section A of the Contract Documents.

3.2. SUBMISSION REVIEW

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

3.3. SUBSTITUTION APPROVAL

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

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

3.4. SUBSTITUTION REQUEST FORM

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:*

END OF SECTION

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SECTION 00 43 43
WAGE RATES FORM

PART 1 – GENERAL

1.1. SUMMARY

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

B. The Reimbursable Labor Rate Worksheet shall provide the basis for labor rates being used on Change Order Request forms.

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

A. Prior to the Pre-Construction Meeting the City Project Manager (CPM) or the City Construction Manager (CCM) shall provide the GC a copy of the *Reimbursable Labor Rate Worksheet.xls*.
   1. See the last page of this specification for an example of the worksheet.

B. The GC shall provide all subcontractors that will be performing productive labor during the execution of this contract with additional copies of the worksheet as needed.

C. All contractors shall be required to fill out and submit completed worksheets for all Trades and Classifications of labor that will be performing productive labor during the execution of this contract.

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

A. The GC shall consolidate all Trades and Classifications into one master Excel Workbook of all trades.

B. The GC shall provide the combined workbook as required by Section 1.6 of Specification 01 32 19 Submittals Schedule for review and approval by the Owners Representatives.
   1. Submittal shall be an Exported PDF of the completed Excel Workbook.
      a. As an Exported PDF the individual worksheets will be bookmarked and the document will be word searchable for easy reference.

C. The GC shall only use the rates posted in the approved submittal throughout the execution of this contract.

Reimbursable Hourly Rate Worksheet

(see bottm of page for instructions)

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

Enter TRADE Here:
Carpenter

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

Enter **YOUR** percentage of base rate in the column below.

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

Form Instructions:

1. Provide a work sheet for ALL Trade Classifications that will be performing on site productive labor during the execution of this project.

2. Responsible contractor to complete only boxes that are shaded, all non-shaded boxes are formula driven.

3. Contractor shall provide the name of the source used for these rates. (union contract, Bureau of Labor and Statistices, AGC, ABC, etc.) and be prepared to provide copies if so requested.

END OF SECTION

SECTION 00 62 76.13
SALES TAX FORM

PART 1 – GENERAL

1.1. SUMMARY

A. The City of Madison is a qualifying tax exempt entity in the State of Wisconsin.

B. The Contractor shall refer to *Section 102.9 – Bidders Understanding* of the *City of Madison FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction* for more information on Tax Exempt Status.

C. This project constructs or remodels facilities owned by the City of Madison in Madison, Wisconsin.

1.2. RELATED SPECIFICATION SECTIONS

A. Parts of this specification will reference articles within "The City of Madison FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction".

1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONs web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION **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. TAX EXEMPT FORM

A. The Contractor can access Wisconsin Sales and Use Tax Exemption Certificates (form S-211, Wisconsin Department of Revenue) from the City of Madison Finance website.

1. City of Madison tax exempt information and signature by Purchasing Supervisor is already completed.
2. Website: http://www.cityofmadison.com/employeenet/finance/purchasing
   a. Under the title *Purchasing Forms*, scroll down to the form link titled *Sales Tax Exempt Form S-211*.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 23 01
ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 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.

1.03 PROCEDURES

A. Make certain the Bid Form clearly states that costs listed for each alternate include costs of related coordination, modification, or adjustment. If not clearly stated, revise first paragraph and subparagraph below by stating this requirement.

B. 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.

C. 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.

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

E. 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 (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. ALTERNATE 1: The Base Bid excludes Section 09 05 61, 3.07 Provision of Remedial Floor Coating Work for concrete substrates. For this Alternate 1, Include Section 09 05 61, 3.07 Provision of Remedial Floor Coating Work for all concrete substrates scheduled to receive floor finishes. (This alternate-1 addresses the possibility that a concrete test will fail, requiring this moisture mitigation Work.)

END OF SECTION

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SECTION 01 33 29
GENERAL SUSTAINABLE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General project requirements for sustainable design:
   1. The project is pursuing a LEED version 4 for Building Design & Construction: New Construction certification. The targeted LEED certification level is Silver. This requires that all the prerequisites are met and that a total of 50 points are awarded.
   2. The project's LEED consultant will conduct re-occurring meetings throughout both the design and construction phase. The meetings will educate the various team members on their LEED roles and responsibilities.

1.02 RELEVANT REQUIREMENTS

A. General Contractor / Construction Manager must familiarize themself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.

1.03 GUIDANCE DOCUMENTS ISSUED UNDER SEPARATE COVER:

A. The project's LEED consultant will distribute LEED guidance documents to the team that guide them through the LEED requirements; this includes:
   1. **LEED Guidance**
      a. This document provides a list of roles and responsibilities that are specific to the discipline (e.g., civil engineer, HVAC designer, etc.).
   2. **LEED Product Selection Guidance**
      a. This document provides direction when searching for LEED compliant products.
   3. **Low-Emitting Materials**
      a. This document provides direction when searching for insulation, ceilings, and flooring that meet the LEED requirements.
   4. **Waste Management Plan**
      a. LEED compliant Waste Management Plan that outlines the roles and responsibilities with respect to the demolition and construction waste management. The project's waste diversion goal is 75%. This pertains to both demolition and construction waste associated with the project.
   5. **Construction Indoor Air Quality Management Plan**
      a. LEED compliant Construction Indoor Air Quality Management Plan that outlines the roles and responsibilities with respect to indoor air quality during construction.
   6. **LEED Scorecard**
      a. This document lists targeted LEED prerequisites and credits associated with this project.

B. Refer to LEED scorecard for specific LEED credits selected, along with associated points being pursued to achieve LEED Silver.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROCEDURES

A. Recycled Content:
   1. General Contractor / Construction Manager to provide to EUA's sustainability team the total cost of materials from Divisions 3 through 10. Product and Materials cost includes all taxes and expenses to deliver the material to the project site incurred by the contractor but excludes all any cost for labor and equipment required for installation after the material is delivered to the site.
   2. Provide the following for the structural steel and concrete purchases:
      a. Name of supplier.
      b. Product name.

c. Cost of product.
d. Mill-specific pre- and post-consumer recycled content of the steel.
e. Recycled content of the concrete.

B. Construction Team:
1. Implement and inspect the ESC / SWPP plan and perform corrective action(s) as needed. Provide inspection reports to the LEED consultant.
2. Adhere to the Waste Management plan. Provide LEED consultant with the waste tickets of demolition and construction waste that notes diversion rates of the various construction items (e.g., concrete, drywall, cardboard, etc.). This can be provided in either volume or weight.
3. Adhere to the Commissioning Plan authored by the project's Commissioning Provider.
4. Adhere to the Construction IAQ Management Plan and provide monthly inspection reports to the LEED consultant. Reports to include photos of IAQ measures implemented.

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.

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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:*

END OF SECTION

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 Project Architect (PA)/Project Engineer (PE) 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/PE, 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)/Project Engineer (PE): The PA/PE shall be the only person authorized to publish a CB as needed for any reason indicated in section 1.1.A above. The PA/PE 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 they believes that no changes in labor, materials, equipment, or contract duration will be required for additions or deletions.
   2. Submit a COR when they 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/PE 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/PE 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/PE shall click the link in the left margin of the project web site opening a new form. Project information is pre-loaded, the PA/PE 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/PE shall draft a CB as needed using the Construction Bulletin form on the Project Management Web Site.

1. The PA/PE 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/PE shall amend the draft as necessary into a final CB for review

B. Once the final CB has been approved the PA/PE 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 their 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 FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction".

1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONs web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION **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 they 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 FACILITIES MANAGEMENT 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)/Project Engineer (PE), 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/PE 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/PE 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/PE 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 $20,000 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 $20,000.
   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, they 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 the Project Architect (PA)/Project Engineer (PE) 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 FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction”.

1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONs web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the “Part” chapter identified in the specification text. For example if the specification says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION **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 FACILITIES MANAGEMENT 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 FACILITIES MANAGEMENT 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 their 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.

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3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL

A. The Contractor shall upload their 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)/Project Engineer (PE) 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

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)/Project Engineer (PE) 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, they 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 their 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	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 their 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/PE 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/PE shall advise the CPM of any discrepancies in the schedule of values.
C. The PA/PE 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/PE 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/PE 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 their 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 they are confident that all contractual requirements for closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
b. At the option of these project managers the field supervisors may also attend.
3. The Project Architect and at least one design consultant from each discipline represented by the plans and specifications to address open QMOs, final tests, reports, etc.
4. The Owner
5. The CPM
6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
7. The Commissioning Agent
D. The CPM shall publish an agenda and chair the meeting.

3.7 OTHER SPECIAL MEETINGS

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

END OF SECTION

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SECTION 01 31 23
PROJECT MANAGEMENT WEB SITE

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

A. The City of Madison (CoM) has established a cloud-based Project Management Tool (PMT) using an Autodesk product called Autodesk Construction Cloud (ACC).

B. The software is used throughout the design, construction and warranty process of major remodels and new construction projects.

C. Initially deployed in mid-2023, the PMT software will be deployed on all projects. The PMT software is cloud-based software and therefore will receive regular updates and enhancements.

1.2. AUTODESK CONSTRUCTION CLOUD PROCEDURE OVERVIEW

A. The CoM PMT is 3 main modules. The Autodesk Docs (https://help.autodesk.com/view/DOCS/ENU/) module is a document management file system that is the foundation of ACC. The Build https:/help.autodesk.com/view/BUILD/ENU/ module has many sections that assist in performing day to day functions of design/construction management while reducing the use of different software platforms, surface mail, email and email attachments. Finally, the Cost management (https://help.autodesk.com/view/BUILD/ENU/?guid=Cost_Overview) module is used to manage project finances.

1. Files within Autodesk Docs can store a wide variety file formats (https://help.autodesk.com/view/DOCS/ENU/?guid=Supported_Files_Docs) including but not limited to Word, Excel, PDF, photographs (all popular formats), etc.
2. The Issues section within the Build module is used for Punch Lists, Quality Control and Warranty issues.
3. File Folder and module section access are controlled by Permission Groups and Permission Level

B. A tutorial document on the web based PMT will be provided to the General Contractor (GC) who is awarded the contract. Additional training will be provided as needed for the GC and Sub-Contractors (SC) by the CoM.

C. The PMT has predefined work flows that channel automated alerts as documents are uploaded, reviewed, and completed. These workflows are designed for inbound information from the contractor as well as outbound information from the Architectural/Engineer consultant and the Owner.

D. The GC will be required to receive email notifications, access the internet to review related documentation and be able to upload/download documentation to the various project modules or folders.

E. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related documentation. Prior to setting up the final PMT the GC and CPM shall meet to review all ACC workflows, the GC will determine to what level over the minimum requirements the SC's will be involved.

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. AUTODESK CONSTRUCTION CLOUD SYSTEM RELATED PRODUCTS

A. Autodesk Construction Cloud is an Autodesk 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. Please consult Autodesk's web site for the latest system requirements (https://help.autodesk.com/view/BUILD/ENU/?guid=System_Requirements_ACC)

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. Autodesk Construction Cloud Help (https://help.autodesk.com/view/BUILD/ENU/) and Learning Center (https://learnacc.autodesk.com/) are kept up to date with latest ACC features.
2. For more customized workflows, Project Management Software Tutorials have been developed. These tutorials are in a PDF printable format with screen shots and associated instructions on how to access and use the PMT.
3. 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)
4. Phone Contact number and professional name must be entered by each user themselves via https://profile.autodesk.com/
5. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
6. 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 City Project Admin is responsible for uploading all project directory data into ACC, adding users to project and licenses to users for all non-city staff (GC/SC staffs).

C. All GC/SC staff will be notified through an automated email from Autodesk directing them to create an Autodesk account if they do not already have one. It is the responsibility of each GC/SC to follow the instructions to setup their own account

D. Once the GCPM has received his/her project invitation, 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

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 23
SURVEY AND LAYOUT DATA

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to set forth the minimal required guide lines to be followed by the General Contractor (GC) and the Land Surveyor (Surveyor) including but not limited to the following:
   1. Surveyor Professional Requirements
   2. Horizontal and Vertical Datum Control
   3. Local Control (if any)
   4. Electronic File and Data Requirements
   5. As-Built Documentation Requirements

B. When working on any City of Madison project, OSHA standards must be complied with. The Surveyor shall provide appropriate traffic control in accordance to the Manual on Uniform Traffic Control Devices (MUTCD).

C. The Surveyor shall be responsible for notifying Diggers Hotline in advance of beginning the field work for this contract.

1.2. RELATED SPECIFICATIONS

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

1.3. SURVEYOR QUALIFICATIONS

A. The General Contractors, Land Surveyor Sub-Contractor shall meet or exceed the following:
   1. The Principal Land Surveyor (PLS) shall be licensed to practice in the State of Wisconsin.
      a. The PLS's license shall be current at the beginning of the contract and the PLS shall maintain an active license throughout the execution of this contract.
   2. The PLS shall have a minimum of minimum of ten (10) years of field experience on similar projects of scope and size.
      a. Land Surveyors working under the direction of the PLS shall have a minimum of five (5) years of field experience on similar projects of scope and size.

B. The PLS shall be responsible for checking and verifying all work being performed under the PLS's direction during the execution of this contract. This shall include but not be limited to periodic field checks of equipment and survey data for accuracy and compliance with the contract documents.

1.4. QUALITY ASSURANCE

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

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

1.5. SUBMITTALS

A. After initial project setup the PLS shall provide the following information as a Survey Data Submittal for review by the CPM/CCM, and Owner. See Specification 01 33 23 – Submittals for more information.
1. Copy of the PLS (and any supporting staff) current State of Wisconsin registration certificate/licenses.
2. Digital Survey Submittal on a thumb drive delivered to the CPM/CCM. Submittal Survey shall be on a thumb drive or CD in Auto CAD 2017, MicroStation V8i, or DXF format. Digital Submittal shall be of the project site setup showing all of the following:
   a. Key features not scheduled for demolition, including but not limited to building corners, roof overhangs, and door locations.
   b. Location of construction limits fencing.
   c. Locations of PLSS and/or project control points provided by the Owner.
   d. Locations of project based control points.
3. Printed Survey Submittal shall be the same as item 1 above in PDF format. PDF file shall be formatted to print to scale on 24"x36" sheets as required to show all features with text neatly organized for each item identified. When multiple sheets are used a match line and sheet references shall be required.
4. PDF file of the complete level/layer scheme. Scheme shall be in tabular form formatted to 8.5 by 11 paper and shall include all of the following:
   a. Level/layer designation (abbreviation).
   b. Level/layer designation (full title).
   c. Feature attribute characteristics (line weight, line style, font, etc.).
   d. Cell attribute information
   e. Samples of line styles and cells.

1.6. EXAMINATION

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. PRE-CONSTRUCTION OWNER SUPPORT

A. The CPM/CCM shall provide the GC/PLS with a digital CAD seed file on or before the Pre-construction meeting.
1. Seed file shall be a MicroStation 3D seed file using the datum indicated above. Seed file shall be delivered as a MicroStation V8i or DXF format as requested by the PLS.
   a. Seed file shall be used as the PLS's initial base file for all future work on this contract.

3.2. UTILITY LOCATING

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

3.3. SURVEY CONTROL AND LAYOUT DATA

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

3.4. TOPOGRAPHIC SURVEYING

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

3.5. SITE SURVEY AS-BUILT

A. See Specification 01 78 39 As-Built Drawings, Section 3.2 for more information on required record site information to be provided prior to contract closeout.

B. The GC shall be responsible for scheduling the PLS to capture locations and depths of all buried utilities prior to any contractor back filing trenches. The Owner may require missing information to be located and surveyed at the GC's expense.

END OF SECTION

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SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING

PART 1 – GENERAL

1.1. SUMMARY

A. Daily records of project activities, resources used, weather conditions, and other information related to the ongoing progress of the project are extremely important at all levels of Construction Management.

B. Daily records provide the base for weekly progress reports and updating progress schedules.

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 31 19 Project Meetings

B. Section 01 31 23 Project Management Web Site

C. Section 01 32 23 Photographic Documentation

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

A. The General Contractor (GC) shall be responsible for all Construction Progress Reporting as outlined in this and other specifications as noted.

B. The GC shall maintain daily progress journals in a format of their choosing provided it is legible and contains the information as outlined in 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

3.0 DAILY SIGN-IN SHEET

A. The GC shall provide and maintain a daily sign-in sheet and require all workers and visitors to sign in/out each work day. These daily sign-in sheet reports shall include name/company/time-in/time-out. These reports can be submitted daily or at the end of each week to the City Project Manager or as directed by City Staff.

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 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 33 29
GENERAL SUSTAINABLE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General project requirements for sustainable design:
   1. The project is pursuing a LEED version 4 for Building Design & Construction: New Construction certification. The targeted LEED certification level is Silver. This requires that all the prerequisites are met and that a total of 50 points are awarded.
   2. The project's LEED consultant will conduct re-occurring meetings throughout both the design and construction phase. The meetings will educate the various team members on their LEED roles and responsibilities.

1.02 RELEVANT REQUIREMENTS

A. General Contractor / Construction Manager must familiarize themself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.

1.03 GUIDANCE DOCUMENTS ISSUED UNDER SEPARATE COVER:

A. The project's LEED consultant will distribute LEED guidance documents to the team that guide them through the LEED requirements; this includes:
   1. **LEED Guidance**
      a. This document provides a list of roles and responsibilities that are specific to the discipline (e.g., civil engineer, HVAC designer, etc.).
   2. **LEED Product Selection Guidance**
      a. This document provides direction when searching for LEED compliant products.
   3. **Low-Emitting Materials**
      a. This document provides direction when searching for insulation, ceilings, and flooring that meet the LEED requirements.
   4. **Waste Management Plan**
      a. LEED compliant Waste Management Plan that outlines the roles and responsibilities with respect to the demolition and construction waste management. The project's waste diversion goal is 75%. This pertains to both demolition and construction waste associated with the project.
   5. **Construction Indoor Air Quality Management Plan**
      a. LEED compliant Construction Indoor Air Quality Management Plan that outlines the roles and responsibilities with respect to indoor air quality during construction.

B. Refer to LEED scorecard for specific LEED credits selected, along with associated points being pursued to achieve LEED Silver.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROCEDURES

A. Recycled Content:
   1. General Contractor / Construction Manager to provide to EUA's sustainability team the total cost of materials from Divisions 3 through 10. Product and Materials cost includes all taxes and expenses to deliver the material to the project site incurred by the contractor but excludes all any cost for labor and equipment required for installation after the material is delivered to the site.
   2. Provide the following for the structural steel and concrete purchases:
      a. Name of supplier.
      b. Product name.
      c. Cost of product.
      d. Mill-specific pre- and post-consumer recycled content of the steel.

e. Recycled content of the concrete.

B. Construction Team:

1. Implement and inspect the ESC / SWPP plan and perform corrective action(s) as needed. Provide inspection reports to the LEED consultant.
2. Adhere to the Waste Management plan. Provide LEED consultant with the waste tickets of demolition and construction waste that notes diversion rates of the various construction items (e.g., concrete, drywall, cardboard, etc.). This can be provided in either volume or weight.
3. Adhere to the Commissioning Plan authored by the project's Commissioning Provider.
4. Adhere to the Construction IAQ Management Plan and provide monthly inspection reports to the LEED consultant. Reports to include photos of IAQ measures implemented.

END OF SECTION

Civil Engineer

Sustainable Sites prerequisite – Construction Activity Pollution Prevention

Civil engineer must create an Erosion and Sedimentation Control (ESC) plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2012 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP). Specifically, the ESC plan must address the following three items:

- Erosion and sedimentation control.
- Stabilization.
- Pollution prevention.

Sustainable Sites credit – Site Assessment

Civil engineer must complete a Site Survey. The Site Survey must illustrate the topography of the site and note the flood hazard areas. The civil engineer must also to the complete the topography, hydrology, and soils sections of the Site Assessment worksheet.

Landscape Designer

Sustainable Sites credit – Site Assessment

The landscape designer must complete the vegetation section of the Site Assessment worksheet.

Water Efficiency prerequisite / credit – Outdoor Water Use Reduction

The landscape designer must prepare a landscape design and plant list. The plant list must note the watering needs of each plant type (e.g., low, medium, or high). Confirm if a permanent irrigation system will be required and complete the Outdoor Water Use Reduction calculator.

Architect + MEP Design Team

Energy & Atmosphere prerequisite – Minimum Energy Performance

Adhere to the mandatory provisions of ASHRAE 90.1-2010 sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4.

Energy & Atmosphere prerequisite – Fundamental Commissioning

Adhere to the requirements of the commissioning plan prepared by the Commissioning Authority.

Indoor Environmental Quality – Low-Emitting Materials

Select insulation, ceilings, and flooring that is compliant with the VOC Emissions Evaluation. See Low-Emitting Materials appendix for specification sections this pertains to as well as the specific requirements of the VOC Emissions Evaluation.

Architect

Sustainable Sites credit – Site Assessment

The architect must complete the climate, human use, and human health effects sections of the Site Assessment worksheet.

Materials & Resources prerequisite – Storage and Collection of Recyclables

Provide dedicated area(s) accessible to waste haulers and building occupants for the collection and storage of recyclable materials for the project area pursuing LEED certification. Recyclable material must include:

- Mixed paper.
- Corrugated cardboard.
- Glass.
- Plastics.
- Metals.
- Batteries.
- Electronic waste.

Indoor Environmental Quality prerequisite – ETS Control

The architect must ensure that 'No Smoking within 25 feet of the building" signage is located at all regularly used building entrances. Signage shall also be located at exterior deck locations of the project.

Lighting / Electrical Designer

Location and Transportation credit – Electric Vehicles

Provide electric vehicle charging stations, or electric vehicle-ready stations, at least 10% of all parking spaces. The locations do not need to be preferred locations (i.e. closest walkable distance to the building entrance). The charging stations must meet the following requirements:

- Provide a level 2 charging capacity (208 – 240 volts) or greater for each required space.
- Comply with SAE Surface Vehicle Recommended Practice J1772.
- Be capable of responding to time-of-use market signals (e.g. price).
- Meet the connected functionality criteria for ENERGY STAR certified electric vehicle supply equipment; this includes:
    - Grid Communications: The product shall include a communication link that can support Demand Response. This link shall use open standards, as defined in this specification, for all communication layers.
    - Open Access: To enable interconnection with the product over the communication link, an interface specification, application programming interface (API) or similar documentation that is intended to enable DR functionality shall be made readily available.
    - Consumer Override: The product shall be capable of supporting DR event override-ability by consumers.

Indoor Environmental Quality credit – Interior Lighting

Provide dimmable or multi-level control of lights for all regularly occupied spaces.

Plumbing Designer

Water Efficiency prerequisite / credit – Indoor Water Use Reduction

Plumbing designer to select plumbing fixtures that meet the LEED prerequisite/credit. At a minimum this includes:

Residential Plumbing Fixtures

- Water Closets, 1.28 gallons per flush (or lower) and is WaterSense Labeled.
- Private lavatory faucets, 1.20 gallons per minute (or lower).
- Residential kitchen faucets, 1.5 gallons per minute (or lower).
- Showers, 2.0 gallons per minute (or lower) and is WaterSense Labeled.

Public (non-residential) Plumbing Fixtures

- Water Closets, 1.60 gallons per flush (or lower) and is WaterSense Labeled.
- Urinals, 1.0 gallons per flush (or lower) and is WaterSense Labeled.
- Public lavatory faucets, 0.50 gallons per minute (or lower).
- Breakroom sink, 1.5 gallons per minute (or lower).
- Showers, 2.0 gallons per minute (or lower) and is WaterSense Labeled.

HVAC Designer

Indoor Environmental Quality prerequisite – Minimum IAQ Performance

Ventilate project as outlined by ASHRAE 62.1-2010 and meet the mandatory provisions of ASHRAE 62.1-2010 sections 4 through 7.

Provide outdoor air monitors for all mechanical ventilation systems with outdoor air intake flow greater than 1,000 cfm. The monitoring device must be capable of measuring the minimum outdoor air intake flow and be capable of measuring the design minimum outdoor air intake flow with an accuracy of +/– 10%. An alarm must indicate when the outdoor airflow value varies by 15% or more from the setpoint.

Alternatively, for constant-volume systems that do not employ demand control ventilation, provide an indicator capable of confirming the intake damper is open to the position needed to maintain the design minimum outdoor airflow as determined during the system startup and balancing.

Exhaust / outdoor air intake locations to meet separation distance requirements outlined by ASHRAE 62.1-2016 Appendix F.

Indoor Environmental Quality credit – Thermal Comfort

Design the HVAC system to meet the requirements of ASHRAE 55-2010.

Provide individual thermal comfort control for at least 50% of individual occupant spaces. All shared multi-occupant spaces must be provided with group thermal comfort controls. Individual / Group thermal comfort control can control either air temperature, radiant temperature, air speed, or humidity.

Examples of eligible thermal comfort controls include thermostats, ceiling fans, adjustable underfloor diffusers, task-mounted controls (such as plug-in desktop fans, humidifiers, or dehumidifiers), and operable windows. Examples of ineligible thermal comfort controls include a ceiling diffuser without an accessible control and a thermostat with a fixed setpoint that cannot be adjusted by occupants.

Construction Team

Sustainable Sites prerequisite – Construction Activity Pollution Prevention

Before site work begins, implement the Erosion & Sedimentation Control plan that has been authored by the Civil Engineer. Each month, and after each rain event of 1/2" or more, inspect the Erosion & Sedimentation Control (ESC) Plan authored by the civil engineer. The inspections must confirm the following strategies are in place:

- Erosion and sedimentation control.
- Stabilization.
- Pollution prevention.

Implement corrective actions when needed.
Provide (ESC) inspection reports to the LEED consultant.

Materials & Resources prerequisite / credit – Construction Waste Management

Adhere to the Construction Waste Management plan provided by the LEED consultant. Waste hauler to provide waste tickets to the LEED consultant. Tickets must itemize waste type (e.g., wood, metal, concrete, etc.) and note the weight of the waste type.

Energy & Atmosphere prerequisite – Fundamental Commissioning

Adhere to the Commissioning plan provided by the Commissioning Authority.

Indoor Environmental Quality credit – Construction IAQ Management

Adhere to the Construction IAQ Management plan provided by the LEED consultant. Once the project building becomes enclosed, inspect the IAQ monthly and provide inspection reports to the LEED consultant. Photos of the following are required each month:

- Clean / organized construction site.
- Entryway(s) so that mud is not tracked into building during construction.
- Construction material stored onsite are elevated off the ground and covered from the elements.
- Ducts are covered on both ends.
- No smoking signage.
- Construction area(s) are separated from finished area(s).

Materials & Resources prerequisite / credit – Construction Waste Management

Provide the material cost of Divisions 3-10.

15% of the div 3-10 material cost must be recycled content to achieve the LEED point; this is achieved through the steel and concrete purchase. Provide the following for the steel and concrete purchases:

Material	Product Name	Description	Manufacturer	Cost	% Post-Consumer Recycled Content	% Pre-Consumer Recycled Content
Steel	*Beam*	*Structural Steel*	*Tindall*	*$100,000*	*80%*	*10%*

APPLIANCES

If appliances are within the project scope:

Install residential clothes dryer and residential dishwashers that are ENERGY STAR labeled.

STEEL, CONCRETE, and WOOD PURCHASES

Cost of Materials from divisions 3-10 = ?

Recycled Content

15% of the div 3-10 material cost must be recycled content to achieve the LEED point; this is achieved through the steel and concrete purchase. Provide the following for the steel and concrete purchases:

Material	Product Name	Description	Manufacturer	Cost	% Post-Consumer Recycled Content	% Pre-Consumer Recycled Content
Steel	*Beam*	*Structural Steel*	*Tindall*	*$100,000*	*80%*	*10%*

Certified Wood

If the wood cost is 3%+ of the total cost of divisions 3-10, provide the following information:

Description	Product Type	Cost	Sourcing
			FSC - forest management via FSC chain of custody
			SFI - forest management via SFI or PEFC chain of custody

Vendor Chain of Custody (COC) certificate numbers must be provided for all wood products with Forest Stewardship Council (FSC) certification and/or Sustainable Forestry Initiative (SFI)

ENVIRONMENTAL PRODUCT DECLARATIONS
&
HEALTH PRODUCT DECLARATIONS

Select (20) permanently installed products sourced form at least (5) different manufacturers that include an Environmental Product Declaration (EPD).
Select (20) permanently installed products sourced form at least (5) different manufacturers that include a Health Product Declaration (HPD).

Most declarations are provided by:

- Insulation. (Division 07 – Thermal and Moisture Protection)
- Flooring. (Division 09 – Finishes)
- Gypsum Board. (Division 09 – Finishes)
- Ceiling Tile. (Division 09 – Finishes)
- Paint. (Division 09 – Finishes)
- Doors & Hardware. (Division 08 – Openings)

Most common products with EPD's and HPD's:

Material Type or Category	Product Name	Description of Product	Manufacturer Name
Rockwood K1050 Kickplate	Rockwood K1050 Kickplate	Rockwood K1050 Kickplate	Rockwood
5/8" ToughRock® Fireguard C® Gypsum Panel	5/8" ToughRock® Fireguard C® Gypsum Panel	5/8" ToughRock® Fireguard C® Gypsum Panel	Georgia-Pacific
Mill Certified Cold Formed Steel Products	Mill Certified Cold Formed Steel Products	Mill Certified Cold Formed Steel Products	ClarkDietrich Building Systems
Thermafiber UltraBatt Mineral Wool Insulation	Thermafiber UltraBatt Mineral Wool Insulation	Thermafiber UltraBatt Mineral Wool Insulation	Owens Corning
Johnsonite Baseworks Thermoset Rubber Wall Base	Johnsonite Baseworks Thermoset Rubber Wall Base	Johnsonite Baseworks Thermoset Rubber Wall Base	Tarkett
Structural / Curtain Wall Studs & Track	Structural / Curtain Wall Studs & Track	Structural / Curtain Wall Studs & Track	Cemco
ProMar® 200 Zero VOC Latex paint - Eggshell	ProMar® 200 Zero VOC Latex paint - Eggshell	ProMar® 200 Zero VOC Latex paint - Eggshell	Sherwin Williams
Calla Ceiling Panels	Calla Ceiling Panels	Calla Ceiling Panels	Armstrong
EcoWorx® Carpet Tile with EcoSolution Q® Face Fiber	EcoWorx® Carpet Tile with EcoSolution Q® Face Fiber	EcoWorx® Carpet Tile with EcoSolution Q® Face Fiber	Shaw Contract Group

Low-Emitting Materials

Insulation must meet the VOC Emissions Evaluation.

The ***insulation product category*** includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.
Exclude insulation for HVAC ducts and plumbing piping.

SpecLink Sections:
07 21 00 - Thermal Insulation
07 53 00 - Elastomeric Membrane Roofing
07 54 23 – Thermoplastic-Polyolefin Roofing (TPO)

Note:
*Spec Sections **07 42 13.19 Insulated Metal Wall Panels** are excluded from the requirements of the Low-Emitting Materials credit.*

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Ceilings must meet the VOC Emissions Evaluation.

The ***ceiling product category*** includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.
Exclude overhead structural elements.

SpecLink Sections:
09 51 00 - Acoustical Ceilings
09 84 00 - Acoustic Wall Panels

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Flooring must meet the VOC Emissions Evaluation.

The ***flooring product category*** includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, underlayments, and other floor coverings.
Exclude subflooring and wet-applied products applied on the floor.

Stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring are considered fully compliant without any VOC testing if they do not include integrated organic-based surface coatings, binders, or sealants.

SpecLink Sections:
09 21 16 - Gypsum Board Assemblies
09 30 00 – Tiling (Including Floor)
09 65 00 - Resilient Flooring
09 65 66 - Resilient Athletic Flooring
09 68 13 - Tile Carpeting
09 68 16 - Sheet Carpeting

……

Paints & Coatings must meet the VOC Emissions Evaluation AND VOC Content Evaluation.

The ***paints and coatings product category*** includes all interior paints and coatings wet-applied on site.
Exclude foamed-in place and sprayed insulation. (include in insulation product category)

SpecLink Sections:
09 91 23 – Interior Painting

……

Low-Emitting Materials

VOC Emissions Evaluation

Product has been tested according to California Department of Public Health (CDPH) Standard Method v1.2-2017 and complies with the limits of Table 4-1 of the method. Additionally, the range of total VOCs after 14 days was measured as specified by the method and is reported (TVOC ranges: 0.5 mg/m^3 or less, between 0.5 and 5 mg/m^3, or 5 mg/m^3 or more).

Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Products used in any setting other than schools and classrooms must be modeled to private office scenario. The statement of product compliance must include the exposure scenario used, the range of total VOCs, and must follow the product declaration guidelines in CDPH Standard Method v1.2-2017, Section 8.

Manufacturer statements must also include a summary report from the laboratory that is less than three years old and the amount of wet-applied product applied in mass per surface area (if applicable). Organizations that certify manufacturers' claims must be accredited under ISO/IEC 17065.

VOC Content Evaluation

Paints and coating meet the VOC content limits outlined within California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings & South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.

Statement of product compliance must be made by the manufacturer. Testing methods must follow methods outlined within CARB/SCAQMD.

Methylene chloride and perchloroethylene may not be intentionally added.

EUA will review product submittals and obtain the documentation required for the LEED application from the manufacturer's websites.

LEED ONLINE

Provide statements of compliance for each compliant product, demonstrating the product meets the low-emitting criteria:

- For third-party claims include the product certificate from the third-party certifier
- For manufacturer claims (also called self-declared or first-party claim),
  - For compliance with VOC emissions evaluation, include:
    - Test certificate or summary report from an ISO/IEC 17025 accredited laboratory demonstrating a representative sample of the product was tested
      - For paints and coatings, adhesives and sealants products, the document must also include amount of wet-applied product applied in mass per surface area during testing
    - A manufacturer statement of conformity
  - For compliance with inherently nonemitting, VOC content evaluation, or Formaldehyde emissions evaluation, include:
    - Product information or manufacturer statement of conformity

For third-party emissions evaluations, GBCI accepts a certificate with a certification period that overlaps the project's estimated design/specification phase, or up to roughly a year before construction. Certificates with a certification period that begins after the project's construction phase will not be accepted.

Manufacturer claims must be less than three years old. Claims with a test date that occurs after the project's construction phase will not be accepted.

State Street Campus Garage Mixed-Use

Waste Management Plan

Waste Management Plan

Goals and Scope of Work

The project will be pursuing a LEED certification. Pursuant to this end, the owner is committed to minimizing reliance on landfills as the primary disposal destination for waste and recognizes that recycling is only one part of a comprehensive waste reduction program.

A Waste Management Plan has been implemented with the following goals:

1. Outline at least five materials targeted for diversion.
    a. Provide the anticipated % of total waste that these materials will represent
    b. Include on-site diversion strategies
2. Improve the sustainability of construction practices, from procurement to disposal in order to reduce the amount of waste generated.
3. Divert construction and demolition waste from disposal in landfills and incineration facilities by redirecting recyclable and reusable materials to appropriate management companies.
4. At least 75% of construction and demolition waste (by weight) will be diverted from the landfill.

Responsible Parties

The construction manager has appointed a Waste Management Coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

The coordinator will be responsible for training workers, subcontractors, and suppliers on proper waste management procedures as appropriate for the work occurring at project site.

The coordinator will distribute this waste management plan to each subcontractor when they first begin work on-site. Workers, subcontractors, and suppliers shall be trained on proper waste management procedures as appropriate for the work occurring at project site.

The procedures and locations established for salvage, recycling, and disposal will be reviewed in regular construction management meetings.

Construction Manager's Waste Management Coordinator

Company Name
Contact Name
Contact info

Waste Hauler Contact Information

Company Name
Contact Name
Contact info

Implementation Guidance

Waste Reduction

The following strategies are recommended to reduce the quantity of waste generated on site:

1. Give preference to supply companies that can provide material in the dimensions specifically needed for the project or in quantities closer to the exact amount needed.
2. Give preference to supply companies that provide minimal packaging beyond that required for product protection, or those that ship materials in reusable or returnable packaging such as pallets or containers.
3. Give preference to supply companies that accept returns of unused construction material.
4. Protect materials from damage by storing them away from equipment traffic patterns, elevating them off the ground, storing them under cover, and keeping them level to prevent warping or twisting.
5. Use products efficiently by keeping them organized and emptying one pallet or shipment before opening the next.
6. Additional waste reduction strategies should be considered by each contractor and brought to the construction manager for approval. These efforts are optional, but popular strategies include:
    a. Clean concrete chunks, old brick, broken blocks and other masonry rubble can be used as backfill along foundation walls.
    b. Left over dirt and aggregate from excavation may be stored separately and sold or reused in site landscaping.
    c. Branches and trees from site clearing can be stored separately and chipped for use on the site as landscaping mulch.
    d. Set aside, in a marked and designated area, lumber and plywood/oriented strand board (OSB) cut-offs that can be used as fire blocking, spacers in header construction and in other ways.
    e. Set aside, in a marked and designated container, clean sawdust for use in compost piles or around planting areas. Avoid sawdust that might contain painted or treated wood. This should be bagged separately and sent to appropriate facilities.
    f. Set aside, in a marked and designated area, large drywall scraps for use as filler pieces in small hidden areas.
    g. Install leftover insulation in interior wall cavities if it cannot be used on another job.

Recycling and Salvage

This project's waste hauler has determined the criteria for separation of recyclable and salvageable waste from landfill waste, and the Waste Management Coordinator will designate and label specific areas on the project site as necessary for separating salvaged, recycled, reused, donated and sold materials.

Appropriately marked containers or bins will be provided for controlling diverted waste until it is removed from project site. A list of acceptable and unacceptable materials will be included at each container and bin. Containers and bins will be inspected weekly for contamination, and contaminating materials will be removed if found.

Stockpiles of salvaged and porous recyclable materials will be protected from water and dust.

Waste to be Diverted

This project must divert at least five different waste streams, and the construction manager predicts that these materials will represent 75% by weight of the total waste stream.

Excavated materials, land clearance debris, and hazardous waste is not included in this calculation. Alternative daily cover (ADC) and most incinerated waste are not considered diverted.

Composted, recycled, or salvaged waste, and wood waste used as a fuel are considered diverted. Any incinerated material other than wood is not considered diverted unless the waste to energy plant follows the European Commission Waste Framework Directive 2008/98/EC and Waste Incineration Directive 2000/76/EC and meets the applicable European Committee for Standardization (CEN) EN 303 standards.

The materials listed below are typical recyclables by this project's waste processing facilities. Every effort should be made to ensure that these materials are placed in the correct waste collection areas:

- Asphalt
- Acoustical tile and panels
- Ballasts
- Bricks and masonry
- Cabinets
- Cardboard
- Carpet
- Carpet pad
- Concrete
- Demountable partitions
- Doors and frames, door hardware
- Drywall and gypsum board
- Equipment
- Food and beverage containers
- Furniture, fixtures and equipment
- Glass and glazing
- Insulation
- Lamps
- Lighting fixtures
- Lumber (clean, dimensional)
- Mechanical, electric and plumbing equipment and components
- Metals
- Metal studs, runners and accessories
- Packaging Materials:
    a. Paper
    b. Cardboard
    c. Boxes
    d. Plastic sheet and film
    e. Polystyrene packing
    f. Wood crates
    g. Plastic pails
- Rough hardware
- Slurry wall materials
- Structural and miscellaneous steel
- Specialty items such as elevators
- Switchgear and panel boards
- Transformers
- Plastics.
- Piping and conduit
- Plywood and oriented strand board
- Supports and hangers
- Sprinklers
- Valves
- Wood sheet material
- Wood paneling and trim
- Wood studs and joists
- Wiring

<u>Special Handling Instructions (On-site Diversion Strategies)</u>

The special instructions listed below are required by the construction manager or the waste hauler in order to maximize this projects recycling rate. Please conduct the following additional activities prior to placing recyclable waste in the correct waste collection area:

- Acoustical ceiling panels and tile: stack large clean pieces on wood pallets and store in a dry location
    a. Separate suspension system, trim, and other metals from panels and tile and sort with other metals
- Cardboard and boxes: Break down packaging into flat sheets, bundle and store in a dry location. Paper and cardboard containers should remain covered to prevent blow-out.
- Carpet and pad (clean, dry): store in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
    a. Roll large pieces tightly after removing debris, trash, adhesive, and tack strips
- Compost: Waste containers should remain covered to prevent infestation.
- Crates and Pallets: For crates and pallets that remain on site, break down into component wood pieces and comply with requirements for recycling wood.

- Equipment: Drain tanks, piping, and fixtures – seal openings with caps or plugs. Protect equipment from exposure to weather.
- Electrical devices: Separate by type and size.
- Lighting fixtures: Separate lamps by type and protect from breakage
- Metals: Separate metals by type
- Paper: Include paper and beverage containers used by on-site workers in addition to construction waste. Paper and cardboard containers should remain covered to prevent blow-out.
- Piping: Reduce piping to straight lengths and store by type and size - separate supports, hangers, valves, sprinklers, and other components by type and size
- Plumbing fixtures: Separate by type and size
- Polystyrene packaging: Separate and bag material pallets as much as possible, require deliveries using pallets to remove pallets from project site. Containers for plastic should remain covered to prevent blow-out.
- Structural steel: Stack members according to size, type of member, and length
    a. Remove and recycle bolts, nuts, washers, and other rough hardware

Submittals

All construction and demolition waste removed from the site other than excavated soil and land-clearing debris must be tracked.

On a monthly basis and within 30 days of the last pickup, the Waste Management Coordinator will compile a waste management report or spreadsheet which tracks the following for each waste category:

1. Name of hauler
2. Destination of waste (by facility name/location)
3. Quantity of waste landfilled, by weight
4. Quantity of waste salvaged, by weight
5. Quantity of waste recycled, by weight
6. Total quantity of waste
7. Total % of waste diverted

The report will be backed by:

1. Records of all landfilled or incinerated waste sent to a facility licensed to accept it. Records of each pickup will include date, weight of material, and destination or waste hauler name.
2. Records of all recyclable or salvageable waste sent to a facility licensed to accept it. Records of each pickup will include date, type of waste, weight of material, and destination or waste hauler name.
3. Records of salvageable waste donated or sold to individuals and organizations. Records of each donation or sale will include date, type of waste, weight of material, and destination or purchaser name.
4. For waste diverted to a waste-to-energy facility, provided documentation that the facility follows the European Commission Waste Framework Directive 2008/98/EC and Waste Incineration Directive 2000/76/EC and meets the applicable European Committee for Standardization (CEN) EN 303 standards.

<u>For Projects Diverting Commingled Waste</u>
If the project team diverts commingled waste, documentation will be provided to verify the diversion rate. Diversion rate will include product specific totals (e.g. diverted weight of metals, cardboard, etc.). Documentation can either be a project-specific diversion rate(s) provided by the sorting facility or, if the method of recording and calculating is regulated by the local or state governing authority, the average annual recycled rate for the sorting facility. Be sure that the annual recycled rate provided by the regulating authority coincides with the dates in which the project specific waste was received by the facility.

Excluded from Requirements

The only materials excluded from construction and demolition waste management requirements are hazardous waste, excavated soil and land-clearing debris. Alternative daily cover (ADC) must be excluded from diverted waste calculations but included in total construction waste calculations.

Quality Control

The waste reduction progress reports described above will be reviewed by the LEED Consultant to ensure compliance with LEED requirements. The waste report must provide the following information as applicable:

				Commingled Recycling					
Material Description	Material Type	Material Stream	Total amount of materials generated (tons)	Average recycling rate of the sorting facility used during the project active timeline. Include ADC in the recycling rate	Average recycling rate of the sorting faciltiy NOT including ADC (%)	Certified Commingled Recycling Facility?	Diverted Materials (tons)	Percent Diverted (%)	Total Waste Generated (tons)
							0.00	0.00%	0.00
							0.00	0.00%	0.00
							0.00	0.00%	0.00

State Street Campus
Garage Mixed-Use

Construction IAQ Management Plan

Construction IAQ Management Plan

Goals and Scope of Work

The owner would like to promote the well-being of construction workers and building occupants (if applicable) by minimizing indoor air quality problems associated with construction and/or demolition/renovation.

A Construction IAQ Management Plan has been developed and implemented for the construction and preoccupancy phases of the project. The plan addresses the following five control measures:

1. HVAC Protection.
2. Source Control.
3. Pathway Interruption.
4. Housekeeping.
5. Scheduling.

The plan outlines the methods that can be implemented to protect absorptive materials from moisture that are stored and/or installed onsite.

As required by LEED, the plan follows the guidelines of SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008-2008, Chapter 3.

Responsible Parties

The construction manager has appointed a Construction IAQ Management Coordinator to be responsible for implementing, monitoring, and reporting status of IAQ best management practices. This coordinator shall be present at the project site full time for the demolition and construction duration of project.

The coordinator will be responsible for training workers, subcontractors, and suppliers on proper IAQ management procedures as appropriate for the work occurring at project site.

The coordinator will distribute this IAQ management plan to each subcontractor when they first begin work on-site. Workers, subcontractors, and suppliers shall be trained on proper IAQ management procedures as appropriate for the work occurring at project site.

The current IAQ procedures and the construction zones where they are in effect will be reviewed in regular construction management meetings.

All IAQ efforts shall be inspected on a weekly basis by the IAQ Management Coordinator. Where failures are discovered, efforts will be made to return to compliance within one week. Repeated failures will be discussed at the regular construction meetings.

<u>Construction Manager's IAQ Management Coordinator</u>

Company
Name
Cell
e-mail

Implementation Guidance

HVAC PROTECTION

Keep contaminants out of the HVAC system. Do not run permanently installed equipment during construction if possible or maintain proper filtration if permanently installed equipment is energized during construction.

1. Major HVAC equipment and ductwork should be sealed at the factory/shop and wrapped completely in a non-porous covering. This covering shall be removed only when necessary and if removed, must be replaced prior to installation to prevent equipment and duct from being exposed to airborne contaminants, debris and moisture.
2. Seal unfinished runs of ductwork at the end of each day.
3. Prior to operation, all installed duct openings shall be covered with a non-porous material to prevent airborne contaminants, debris and moisture from entering the duct.
4. Prior to operation, a duct inspection shall be performed by the site superintendent and HVAC contractor to determine if the duct interiors require cleaning.
5. If conditioning is required during construction, use supplementary HVAC units instead of permanently installed equipment if possible.
6. If permanently installed HVAC system must be used during construction, install filtration to protect the return (negative pressure) side of the system. Return duct openings and return grilles shall be covered with a “MERV 8” filter media that will be changed at regular intervals. Filter media shall be changed weekly or when a visual inspection deems the filter inadequate. The goal is to complete filter changes more often than necessary to ensure the ductwork stays clean.
7. Temporary filtration shall only be removed for system testing and balancing to ensure accurate readings.
8. Prior to occupancy, all temporary filtration shall be removed and all permanent filtration media will be replaced with new product. The date of change and the replacement media should be logged with the Construction Manager.
9. Prior to occupancy, duct cleaning shall be performed if the preventive measures listed above have not kept the ductwork clean.
10. A “Filter Log” shall be maintained for each of the filtered areas.
11. Do not store materials in mechanical rooms, to reduce potential debris and contaminants to mechanical systems.

SOURCE CONTROL

Keep sources of contaminants out of the building and have a plan to eliminate any that are introduced.

1. Outside air used for ventilation should be filtered, kept free from airborne contaminants and construction debris (see HVAC protection).
2. To minimize the levels of Volatile Organic Compounds (VOCs) in the workspace, products with low VOC levels shall be used on this project. Use low-toxicity and low-VOC materials to the greatest extent possible. If any materials are determined to have high VOC levels and no alternate is available, a product and activity specific plan to reduce impact shall be prepared, implemented and documented. Isolate areas where high-toxicity materials are being installed and use temporary ventilation for that area.
3. Containers of materials, such as paints, coatings, adhesives and sealants must be closed when not in use.
4. All trash shall be removed from the work area on a daily basis to reduce the build-up of VOC’s. Cleanliness shall be monitored and enforced (see Housekeeping).
5. Construction vehicles, tools and equipment are prohibited inside the building once it is enclosed if they require fuel(s) such as gasoline or diesel for usage.
6. Idling of motor vehicles or construction equipment is prohibited where exhaust fumes can be drawn into the building. When motorized equipment shall not be in use, it must be turned off.

7. Jobsite is no smoking. Smoking is only allowed outside the building in designated areas. Designated smoking location will be at least 25 feet from the buildings.
8. Protect stored materials from moisture because absorbent materials exposed to moisture during construction can mold and degenerate long after installation. Store materials in dry conditions indoors, under cover, and off the ground or floor.
9. If materials are improperly exposed to moisture, replace the material and consider testing air quality before occupancy to make sure no mold contamination has occurred.

PATHWAY INTERRUPTION

Prevent circulation of contaminated air when cutting concrete or wood, sanding drywall, installing VOC-emitting materials, or performing other activities that affect IAQ in other work spaced.

1. Temporary doors and walls shall be constructed and the perimeters sealed to prevent dust, debris, and airborne contaminants from entering the occupied or completed areas of the building.
2. In adjoining spaces where one finished zone is next to an unfinished zone, doors or air barriers shall be erected to prevent construction activity from causing indoor air quality issues in the finished space.
3. Isolate areas of work to prevent contamination of other spaces, whether they are finished or not. Seal doorways, windows, or tent off areas as needed using temporary barriers, such as plastic separations. Provide walk-off mats at entryways to reduce introduced dirt and pollutants.
4. Ensure a sufficient pressure differential between work areas and occupied or completed areas of the building, sufficient to ensure that pathways for contaminates do not exist.
5. If any high VOC products are specified, work areas shall be isolated and exhausted and only workers with the appropriate PPE shall be allowed in that area. Exhausting of this area cannot affect the air quality of any other work area, occupied or completed space.
6. Depressurize the work area to allow a differential between construction areas and clean areas. Exhaust to the outdoors using 100% outdoor air, if possible.
7. Use dust guards and collectors on saws and other tools.

HOUSEKEEPING

Maintaining a clean job site results in fewer IAQ contaminants to manage.

1. Maintain good job site housekeeping on a daily basis & keep materials organized to improve job safety as well as indoor air quality.
2. Use vacuum cleaners with high-efficiency particulate filters and use sweeping compounds or wetting agents for dust control when sweeping.
3. All trash, debris and dust shall be cleaned up from the construction area and all floors swept at each Close of Business or 24 hour period.
4. Petroleum based products shall not be used when sweeping floors. Wherever possible, non-toxic, environmentally friendly cleaning supplies shall be used during the construction process. Approval of cleaners must be granted by the Construction Manager prior to delivery to the site.
5. The housekeeping plan will follow the recycling guidelines of the Construction Waste Management Plan.
6. No waste or construction materials will be stored in the AHUs. All access doors on the AHU's shall be locked with padlocks to prevent storage of any type or shall be kept covered with factory wrapping.
7. All material spills shall be removed and the area will be cleaned as soon as possible.
8. All accumulated water indoors shall be removed on a daily basis to prevent mold.

SCHEDULING

Scheduling of systems will begin once the building is 75% enclosed. Sequence construction activities to reduce air quality problems in new construction projects. For major renovations, coordinate construction activities to minimize or eliminate disruption of operations in occupied areas.

1. The use of temporary air handling equipment and/or natural ventilation shall be maximized during working hours to supply fresh air to the space.
2. The use of exhaust fans and negative air machines shall be maximized during the working hours to remove dust and contaminants from the space, but should not jeopardize the building pressure and zone pressure controls.
3. Filter changes will be performed on an as-needed basis and shall be documented on the 'Filter Change Log' (see HVAC protection). An individual filter log shall be kept and attached to all equipment utilizing filters.
4. When a construction schedule is available, air handling units and exhaust fans in operation should be set for the work hours through the building automation system, if available, and local controls if a BAS is not connected.
5. Materials that will contain VOC's shall be staged in an open air space for 24 hours before being brought into the building. If no open air space is available on-site, these materials must be a stored in a negatively pressurized area, preferably with direct exhaust, operating 24/7.
6. To minimize the exposure to dust, humidity and VOCs, absorptive materials will not be delivered to the site until the day before they are scheduled to be installed.
7. Drywall should have the prime coat of paint installed as soon as possible after installation.
8. Construction shall be sequenced in an effort to reduce the absorption of VOCs by absorbent materials.
9. Schedule construction activities such that materials containing VOCs, such as paints, shall be installed prior to absorbent materials whenever possible, or given proper drying time prior to the installation of additional absorptive materials.
10. Keep trades that affect IAQ physically isolated on site and separated from each other by the construction schedule. For example, schedule drywall finishing and carpet installation for different days or different sections of the building. Consider after-hours or weekend work if practical.

ABSORBENT MATERIAL PROTECTION

The protection of absorbent materials will begin once the products are on site.

1. All absorbent materials shall be covered on all six sides and elevated to prevent absorption.
2. In the event an absorbent material gets wet, it shall be replaced.
3. Unless required by code, installed drywall shall not touch the floor. This is necessary to limit absorption of any liquids.

Submittals

The IAQ Management Coordinator will produce monthly IAQ inspection reports, including photographs documenting each IAQ measure in effect during the phase of construction and pre-occupancy:

Please note: Photographs should be dated and annotated to indicate the IAQ measure depicted and the general location of the photograph.

Additionally, the IAQ Management Coordinator should provide a description of the methods by which absorptive materials (installed or stored on-site) were protected from moisture damage during the construction and preoccupancy phases.

HVAC in Use During Construction
If the project operates permanently installed air handling units during construction, the IAQ Management Coordinator must describe the filtration used on the air handling units.

Submit filter product data for each type of filtration media used during construction and installed immediately prior to occupancy. Include information for installed location, filter manufacturer, filter identification, MERV rating, and pre-occupancy replacement date.

Quality Control

After each IAQ Management progress report is generated, it will be reviewed by the LEED Consultant to ensure compliance with LEED requirements. The LEED consultant will upload inspection reports to LEED Online on behalf of the team.

LEED Scorecard
State Street Campus Garage Mixed-Use

Integrative Process

Y	N		
1	0	IPc1	Integrative Process

Location + Transportation

Y	N		
1	0	LTc1	Sensitive Land Protection
1	1	LTc2	High Priority Site
5	0	LTc3	Surrounding Density and Diverse Uses
5	0	LTc4	Access to Quality Transit
1	0	LTc5	Bicycle Facilities
1	0	LTc6	Reduced Parking Footprint
1	0	LTc7	Electric Vehicles

Sustainable Sites

Y	N		
Y		SSp1	**Constr. Activity Poll. Prevention**
1	0	SSc1	Site Assessment
0	2	SSc2	Protect or Restore Habitat
0	1	SSc3	Open Space
0	3	SSc4	Rainwater Management
0	2	SSc5	Heat Island Reduction
0	1	SSc6	Light Pollution Reduction

Water Efficiency

Y	N		
Y		WEp1	**Outdoor Water Use Reduction**
Y		WEp2	**Indoor Water Use Reduction**
Y		WEp3	**Building-Level Water Metering**
1	1	WEc1	Outdoor Water Use Reduction - 93%
3	3	WEc2	Indoor Water Use Reduction - 33%
0	2	WEc3	Cooling Tower Water Use
0	1	WEc4	Water Metering

Energy + Atmosphere

Y	N		
Y		EAp1	**Fundamental Commissioning**
Y		EAp2	**Minimum Energy Performance**
Y		EAp3	**Building-Level Energy Metering**
Y		EAp4	**Fund. Refrigerant Management**
4	2	EAc1	Enhanced Commissioning
5	13	EAc2	Optimize Energy Performance - 14%
0	1	EAc3	Advanced Energy Metering
1	0	EAc4	Enhanced Refrigerant Management
0	2	EAc5	Grid Harmonization
0	5	EAc6	Renewable Energy - 0%

Materials + Resources

Y	N		
Y		MRp1	**Storage & Collection of Recyclables**
Y		MRp2	**Construction Waste Planning**
0	5	MRc1	Building Life-Cycle Impact Reduction
2	0	MRc2	Environmental Product Declaration
1	1	MRc3	Sourcing of Raw Materials - 15%
2	0	MRc4	Material Ingredients
2	0	MRc5	Construction Waste Management - 75%

52 Points

Indoor Environmental Quality

Y	N		
Y		EQp1	**Minimum IAQ Performance**
Y		EQp2	**ETS Control**
0	2	EQc1	Enhanced IAQ Strategies
2	1	EQc2	Low-Emitting Materials
1	0	EQc3	Construction IAQ Management
0	2	EQc4	IAQ Assessment
1	0	EQc5	Thermal Comfort
1	1	EQc6	Interior Lighting
0	3	EQc7	Daylight
1	0	EQc8	Quality Views
0	1	EQc9	Acoustic Performance

Innovation

0	1	INc1	Exemplary Peformance: EPDs
1	0	INc2	Exemplary Peformance: Reduced Parking
0	1	INc3	Pilot: Safety First, Design for IAQ
1	0	INc4	Innovation: Lamp Purchasing
1	0	INc5	Innovation: O+M Starter Kit
1	0	IN	LEED AP BD+C

Regional Priority

1	0	RPc1	Sensitve Land Protection
1	0	RPc2	Bicycle Facilities
1	0	RPc3	Access to Quality Transit - 3 pts
0	1	RPc4	Optimize Energy Performance - 7 pts
0	1	RPx	High Priority Site - 2 pts
1	0	RPx	Electric Vehicles

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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.

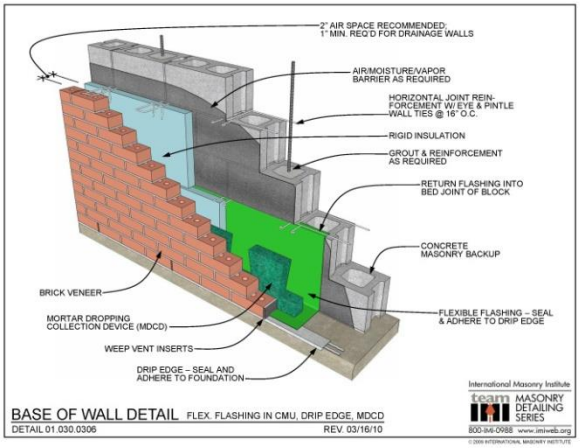
1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily accessible for review.
2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site protected from weather, construction traffic, and other 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

1. Concrete Floor Finish in parking bays, including any transitions between finishes
2. Exterior wall with typical wall with vent, window, and a material change (Concrete Masonry Unit/precast trim unit/masonry veneer)

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, Project Architect (PA)/Project Engineer (PE), 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/PE, 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 their 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/PE 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 their 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 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, consisting of existing facilities.
2. Water supply, consisting of existing facilities.

C. 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.

D. 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 onsite.
C. Provide space for Project Meetings with table and chairs to accommodate a minimum of <fifteen (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 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, City of Madison, Parking logo and name of Owner as indicated on Contract Documents.
2. Names and title of Architect.
3. Name of Prime Contractor.
4. Full color project rendering from high resolution image as furnished by Architect.

PART 3 - EXECUTION

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

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

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

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 FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction".
   1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONs web page:
      http://www.cityofmadison.com/business/pw/specs.cfm
      a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION **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 FACILITIES MANAGEMENT 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 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 ina 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 their 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, they choose to contract with a Waste Management Disposal Company that allows comingled and unsorted waste materials, the GC shall include with their 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 their 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 FACILITIES MANAGEMENT SPECIFICATIONs for Public Works Construction".

1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONs web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION **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 extent of the property line where no existing conditions prevents installation. 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 FACILITIES MANAGEMENT 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)/Project Engineer (PE) and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as necessary.
   1. The PA/PE 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 them 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 FACILITIES MANAGEMENT SPECIFICATION 107.13 shall apply to all tree protection in and around the project site at all times.

3.4. PROTECT UTILITIES

A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and protection requirements prior to installing any construction protection.

1. This includes requesting utility marking through Diggers Hotline.
   a. Call 811 or 1-800-242-8511 to request a public utility locate
   b. For emergency locate call (262) 432-7910 or (877) 500-9592
2. Contact the Owner and CPM for any available private utility information on the property that may be available prior to calling a private utility locating company.

B. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.

1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to not be directly over the utility main.
2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1(g) and Type C Construction Barrels when necessary.
3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1(g) and Type E fencing for areas on soil.
4. Stormwater management features such as greenways, retention/detention ponds, bio-filtration ponds and other such features shall be properly protected according to the appropriate erosion control measure specified on the Erosion Control Plan. See multiple sections of City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1
   a. For the protection of hard to see items such as structures, castings, inlets, etc. in grassy areas provide Type E fencing for areas on soil.
   c. For the protection of storm water management features having special soils and plants such as bio-filtration ponds provide Type E fencing for areas on soil.
5. Other structures and covers including but not limited to cleanouts, wiring hand holes, valve boxes, access structures, grease trap structures, etc shall be protected as follows:
   a. Provide Type E fencing for areas on soil.
   b. When paving operations are complete provide a construction barrel or cone near structures as necessary depending on required heavy construction traffic.

3.5. PROTECT PUBLIC RIGHT OF WAY

A. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.

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

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/PE, and GC mutually deem the project is ready for Final Cleaning. The contractors responsible for protecting the work shall be responsible for removing the protection and removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning materials for removing adhesives, etc.

D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other protection as noted within this specification for the duration of their work.

1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to complete the work being done.

2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc when doing touch-up work.

3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any costs associated with cleaning, repairing or replacing already finished construction at no additional cost to the contract.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

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
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, Project Architect (PA)/Project Engineer (PE), 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/PE, 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/PE the request for Final Progress Payment (100% contract total, less retainage).

B. The PA/PE 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 they have 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_STATE ST RAMP MIXED-USE PROJECT_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. *STATE ST RAMP MIXED-USE PROJECT* 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 their 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, they 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, they 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

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 their 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 their expense, any defect in the Work and any damage to City owned or controlled real or personal property when the damage is a result of:
1. The GC's failure to conform to Contract Document requirements.
   a. Any substitutions not properly approved and authorized may be considered defective.
2. Any defect in workmanship, materials, equipment, or design furnished by the GC or Sub-contractors.

B. All warranties as described in this specification and these Contract Documents shall take effect on the date established by the CPM, as noted in Section 1.3F above.
1. All warranties shall remain in effect for one (1) year thereafter unless specifically stated otherwise in the Contract Documents or where standard manufacturer warranties are greater.

C. The GC's warranty with respect to Work repaired or replaced, including restored or replaced Work due to damage, will run for one (1) year from the date of Owner Acceptance of said repair or replacement.
1. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.

D. Warranty Response
1. See Section 3.5 of this specification.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Warranty Requirements to the GC.

B. Each list shall indicate the title (and plan identifier when applicable) of the warranted item, the associated specification of the warranted item, the terms of the warranty (years), and a column to verify the item has been turned in and completed.

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

1. Consolidating all the warranty lists into one master Warranty Checklist.
   a. The checklist shall be in a tabular data format similar to the sample below.
2. Upload the completed checklist to the Submittal Library on the Project Management Web Site for review. See Specification 01 33 23 Submittals for more information on this procedure.
3. Resubmit the schedule as needed after initial reviews have been completed.

D. The GC shall work with all contractors to amend the Warranty Checklist throughout the execution of the project based on changes and modifications as necessary.

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 STATE ST RAMP MIXED-USE PROJECT, 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 Project Architect (PA)/Project Engineer (PE) and CPM.

F. Correct any deficiencies or omissions and resubmit as necessary.

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

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

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)/Project Engineer (PE), 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/PE 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/PE 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/PE 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/PE and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of their 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)/Project Engineer (PE) 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/PE, CxA and CPM, shall review all Training and Demonstration requirements during two (2) special meetings.
   1. The first meeting shall be held at the 50% Contract Total Payment. During this meeting the following shall be discussed:
      a. Preliminary schedule of training dates to be completed prior to beginning construction closeout.
      b. List of documentation and items that need to be completed and available before and during the training session.
      c. Who (Owner, Maintenance, etc) will be attending what training session(s).
   2. The second meeting shall be held at the 80% Contract Total Payment. This meeting shall review due outs that have not yet been completed for the 90% Contract Total Payment and the requirements necessary for Construction Closeout. All Demonstration and Training sessions shall be completed prior to receiving the 90% progress payment and beginning Construction Closeout Procedures (see Specification 01 77 00).
      a. This does not include any requirement associated with off season equipment preparation and/or demonstration and Training Sessions.

B. All of the Construction Work shall be operationally ready prior to conducting training as follows:
   1. All contractors shall have their As-Built Drawing Records available for reviewing locations of system components during training.
   2. All final and approved Operations and Maintenance Data shall be completed no less than two (2) full weeks prior to the scheduled training.
   3. All systems shall have been started, functionally tested, balanced, and fully operational, and all piping and equipment labeling complete at least two (2) days prior to the scheduled training.
      a. Seasonal equipment shall not be trained out of season. Contractors having seasonal equipment shall work with the GC and CPM for coordinating additional training sessions as appropriate for seasonal equipment.

C. Correction list items that prevent a piece of equipment or system from being fully operational for training shall be corrected prior to conducting the training.

3.3. TRAINING OBJECTIVES

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

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/PE and CPM.

C. The PA/PE and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been met. The PA/PE 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/PE 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/PE 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
SUSTAINABLE DESIGN REQUIREMENTS – LEED FOR NEW CONSTRUCTION V4.0

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. Comply with Wisconsin Commercial Building Codes/International Building Code (IBC).

C. Comply with Americans with Disabilities Architectural Guidelines, and ICC/ANSI A117.1-Latest Edition.

D. Comply with USGBC LEED prerequisites and credits shown in the attached checklist for Project to obtain certification based on USGBC's LEEDv4.0 BD&C: New Construction and Major Renovations" Process.

E. Refer to Specification SECTION 01 33 29 GENERAL SUSTAINABLE REQUIREMENTS for this project's LEED Scorecard

1.2 SUMMARY

A. Project registration and review fees associated with GBCI and leedonline.com are paid by the City.

B. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain certification based on USGBC's LEED BD&C: New Construction and Major Renovations" Version 4.0.

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section.
4. Specific requirements for LEED are included in greater detail in other Sections.

C. A significant portion of the credits required for certification are the responsibility of the A/E and Owner (design credits). These credits are not explicitly outlined in this specification section, however many aspects of the construction documents reflect intent to document and achieve the design credits. This section documents requirements of the contractor to meet the requirements for documenting the construction credits.

D. Related Sections: Divisions 01 through 32 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.3 DEFINITIONS

A. Albedo (a.k.a. solar reflectance): The ratio of the reflected electromagnetic energy to the incoming electromagnetic energy.

B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

C. Emissivity (a.k.a. infrared emittance): A parameter between 0 and 1 that indicates the ability of a material to shed infrared radiation.

D. Environmental Product Declarations: (EPD) is a transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle.

E. Health Product Declaration (HPD) is a material ingredient reporting standard developed under the guidance of the HPD Collaborative.

F. Hydrofluorocarbons (HFCs): Refrigerants used in building equipment that do not deplete the stratospheric ozone layer.

G. LEED: Leadership in Energy and Environmental Design. Green Building Rating System representing the US Green Building Council's effort to provide a national standard for what constitutes a "green building". The standard requires quantitative and technical documentation to demonstrate compliance with goals described in the US Green Building Council's Green Building Rating System, Version 3.0.

H. LEED Project Administrator: LEED Certified Professional hired by the project owner to review LEED submittals.

I. Locally-Manufactured: Refers to the final assembly of components into the building product that is furnished and installed by the trades people. For example, if the hardware comes from Seoul, South Korea, the lumber from Vancouver, British Columbia, and the joist is assembled in Kent Washington, then the location of the final assembly is Kent, Washington.

J. Post-Consumer Recycled Content: The percentage of waste material by weight available from consumer use incorporated into a building material.

K. Pre-consumer (aka Post-Industrial Recycled) Content: The percentage of waste material by weight available from industrial use incorporated into a building material. Post-industrial recyclable materials are different from industrial scrap, a by-product of industrial processes that can easily be reused as a feedstock.

L. Potable Water: Water that is suitable for drinking and is supplied from wells or municipal water systems.

M. Recycling: The collection, reprocessing, marketing and use of materials that were recovered or diverted from the solid waste stream. Note that LEED uses the term "pre-consumer" rather than "post-industrial." Also note that when manufacturers and trade associations use the term "post- industrial" it often includes spills, scraps, and damaged and surplus materials that are fed back into the same manufacturing process and that these materials are not considered recycled content by the LEED rating systems.

N. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

O. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

P. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.

Q. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles from Project site.

R. Solar Reflectance: See "Albedo."

S. Sustainable Forestry: The practice of managing forest resources to meet the long-term product needs of humans while maintaining the biodiversity of forested landscapes. The primary goal is to restore, enhance, and sustain a full range of forest values, both economic and ecological.

T. Type A Finishes: Material and finishes with potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in form requiring vehicles or carriers for spreading which release high level of particulate matter in process of installation and/or curing. Including, but not limited to:

1. Composite wood products, specifically including particleboard from which millwork, wood paneling, doors, or furniture may be fabricated.
2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.
3. Wood preservatives, finishes, and paint.
4. Control and/or expansion joint-fillers.
5. Hard finishes requiring adhesive installation.
6. Gypsum board and associated finish processes.

U. Type B Finishes: Fuzzy material and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gassed by Type A finishes or may be adversely affected by particulates. These materials become "sink" for deleterious substances which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth. Including, but not limited to:
1. Carpeting and padding.
2. Fabric wallcovering.
3. Insulation exposed to air stream.
4. Acoustic ceiling materials.
5. Fabric covered acoustic wall panels.
6. Upholstered furnishings.
7. Materials that can be categorized as both Type A and Type B.

V. Ventilation: The process of supplying and removing air to and from interior spaces by natural or mechanical means.

W. Volatile organic compounds (VOCs): Chemical compounds based on carbon and hydrogen structures that are vaporized at room temperatures. VOCs are one type of indoor air contaminant.

X. Waste Materials: Large and small pieces of materials indicated which are excess to contract requirements and generally include materials salvaged from existing construction and items of trimmings, cuttings, and damaged goods resulting from new installations which cannot be effectively used in Work.

1.4 ADMINISTRATIVE REQUIREMENTS

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

1.5 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Submittals: Submit LEED related information under a separate Tab within each product submittal. The LEED submittal shall include:
1. Summary Sheet: A summary, on General Contractors letterhead, of all LEED information requested in specifications shall include:
   a. STATE ST RAMP MIXED-USE PROJECT.
   b. LEED Submittal List: A list of all materials being submitted. For products com- posed of multiple materials the submittal shall include a list of all materials composing the product.
   c. For Products in Divisions 2 - 10, include the following information:
      i. Material costs, for each material on the LEED submittal list, excluding labor costs, delivery cost, cost of installation, as well as profit and overhead.
      ii. The preconsumer and post-consumer recycled content of each material on the LEED submittal list.
      iii. List of all material manufacturing locations.
      iv. Provide distance between manufacturing and construction site.
   d. All other LEED information required in specification.
2. Manufacturer's literature with information highlighted that confirm the figures used in the summary report.
   a. If a range is used in the manufacturer's literature, the summary report shall use the lowest number in the range.
   b. For VOC Submissions: Submit MSDS sheets or manufacturer's literature with VOC figure highlighted.

D. Project Material Costs Data: Provide a statement, on Contractor's letterhead, documenting the total material for the project. Include a spreadsheet tallying the material cost for all materials specified in Divisions 2 - 32. The total in the material cost data will be used in the LEED Online template to be completed by the Contractor as the actual material cost of the project.

E. LEED Action Plan: Provide preliminary submittal within 30 days of Notice to Proceed that contains:
   1. Example spreadsheets for each construction credit identified in this section.
   2. Contact information for Contractor's LEED coordinators.
   3. Brief description of how the following requirements will be met.
      a. SS Prerequisite: Construction Activities Pollution Prevention complying with Section 31 25 00, Erosion Control.
      b. MR Prerequisite: Construction and Demolition Waste Management Reporting
      c. MR Credit: Building Product Disclosure – Environmental Product Disclosures
      d. MR Credit: Building Product Disclosure – Source Materials
      e. MR Credit: Building Product Disclosure – Material Ingredients
      f. MR Credit: Construction and Demo Waste Management complying with Section 01 74 19 Construction Waste Management and Disposal. Include a sample spreadsheet showing how the tipping information is going to be recorded to comply with LEED requirements.
      g. IEQ Credit: Low-Emitting Materials
      h. IEQ Credit: Construction IAQ Management Plan
      i. IEQ Credit: Indoor Air Quality Assessment
   4. After CPM approval of the Preliminary Action Plan the Contractor shall update the plan monthly with LEED information collected to date and be submitted as part of a monthly progress report.

F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing the actual construction and purchasing activities with LEED requirements for the following:
   1. SS Prerequisite: Construction Activities Pollution Prevention
   2. MR Prerequisite: Construction and Demolition Waste Management Reporting
   3. MR Credit: Building Product Disclosure – Environmental Product Disclosures
   4. MR Credit: Building Product Disclosure – Source Materials
   5. MR Credit: Building Product Disclosure – Material Ingredients
   6. MR Credit: Construction and Demo Waste Management
   7. IEQ Credit: Low-Emitting Materials

G. LEED Documentation Online Submittals: The Contractor shall be responsible for completing the following LEED submissions using the LEED online tool for credit submission to USGBC. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for USGBC submission.
   1. SS Prerequisite: Construction Activities Pollution Prevention
   2. MR Prerequisite: Construction and Demolition Waste Management Reporting
   3. MR Credit: Building Product Disclosure – Environmental Product Disclosures
   4. MR Credit: Building Product Disclosure – Source Materials
   5. MR Credit: Building Product Disclosure – Material Ingredients
   6. MR Credit: Construction and Demo Waste Management
   7. IEQ Credit: Low-Emitting Materials

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
   1. Furniture.
   2. Plumbing.
   3. Mechanical.
   4. Electrical.
   5. Specialty items such as elevators and equipment.
   6. Wood-based construction materials.

1.7 QUALITY ASSURANCE

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

1.8 CONTRACTOR RESPONSIBILITIES

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

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

B. Refer to LEED Guidebook for further information.

2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. MR Credit Product Disclosure and Optimization - Environmental Product Declarations (EPD)

1. At least 20 different products from at least five different manufacturers shall have Environmental Product Declarations that comply with LEED requirements. Industry-wide (generic) Environmental Product Declarations shall be valued as one-half of a product.

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

1. At least 20 different products from at least five different manufacturers shall have publically released reports that comply with LEED requirements for raw material source and extraction reporting. Self-declared reports by manufacturers shall be valued as one-half of a product.

C. MR Credit Product Disclosure and Optimization – Material Ingredients

1. At least 20 different products from at least five different manufacturers shall comply with LEED requirements for material ingredient reporting.

2.3 LOW-EMITTING MATERIALS

A. Paints and Coatings

1. 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:
   - i. Flat Paints and Coatings: 50 g/L.
   - ii. Non-flat Paints and Coatings: 50 g/L.
   - iii. Dry-Fog Coatings: 150 g/L.
   - iv. Primers, Sealers, and Undercoaters: 100 g/L.
   - v. Rust-Preventive Coatings: 100 g/L.
   - vi. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
   - vii. Pretreatment Wash Primers: 420 g/L.
   - viii. Clear Wood Finishes, Varnishes: 275 g/L.
   - ix. Clear Wood Finishes, Lacquers: 275 g/L.
   - x. Floor Coatings: 50 g/L.
   - xi. Shellacs, Clear: 730 g/L.
   - xii. Shellacs, Pigmented: 550 g/L.
   - xiii. Stains: 100 g/L.
2. For field applications that are inside the weatherproofing system, 90 percent of paints and coatings 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. Adhesives and Sealants

1. For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   - i. Wood Glues: 30 g/L.
   - ii. Metal-to-Metal Adhesives: 30 g/L.
   - iii. Adhesives for Porous Materials (Except Wood): 50 g/L.
   - iv. Subfloor Adhesives: 50 g/L.
   - v. Plastic Foam Adhesives: 50 g/L.

vi. Carpet Adhesives: 50 g/L.
vii. Carpet Pad Adhesives: 50 g/L.
viii. VCT and Asphalt Tile Adhesives: 50 g/L.
ix. Cove Base Adhesives: 50 g/L.
x. Gypsum Board and Panel Adhesives: 50 g/L.
xi. Rubber Floor Adhesives: 60 g/L.
xii. Ceramic Tile Adhesives: 65 g/L.
xiii. Multipurpose Construction Adhesives: 70 g/L.
xiv. Fiberglass Adhesives: 80 g/L.
xv. Contact Adhesives: 80 g/L.
xvi. Structural Glazing Adhesives: 100 g/L.
xvii. Wood Flooring Adhesives: 100 g/L.
xviii. Structural Wood Member Adhesives: 140 g/L.
xix. Single-Ply Roof Membrane Adhesives: 250 g/L.
xx. Special-Purpose Contact Adhesives (That Are Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
xxi. Top and Trim Adhesives: 250 g/L.
xxii. Plastic Cement Welding Compounds: 250 g/L.
xxiii. ABS Welding Compounds: 325 g/L.
xxiv. CPVC Welding Compounds: 490 g/L.
xxv. PVC Welding Compounds: 510 g/L.
xxvi. Adhesive Primer for Plastic: 550 g/L.
xxvii. Sheet-Applied Rubber Lining Adhesives: 850 g/L.
xxviii. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
xxix. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
xxx. Special-Purpose Aerosol Adhesives (All Types): 70 percent by weight.
xxxi. Other Adhesives: 250 g/L.
xxxii. Architectural Sealants: 250 g/L.
xxxiii. Non-membrane Roof Sealants: 300 g/L.
xxxiv. Single-Ply Roof Membrane Sealants: 450 g/L.
xxxv. Other Sealants: 420 g/L.
xxxvi. Sealant Primers for Nonporous Substrates: 250 g/L.
xxxvii. Sealant Primers for Porous Substrates: 775 g/L.
xxxviii. Modified Bituminous Sealant Primers: 500 g/L.
xxxix. Other Sealant Primers: 750 g/L.

2. For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants 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."

E. Flooring

1. Flooring 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."

F. Composite Wood

1. Composite wood, agrifiber products, and adhesives shall be made using ultra-low emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

G. Ceilings, Walls, and Thermal Insulation

1. Ceilings, walls, and thermal insulation 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."

PART 3 – EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION ACTIVITIES POLLUTION PREVENTION

A. SS Prerequisite - Construction Activities Pollution Prevention:

1. Follow LEED instructions in LEED NCv4.0 Reference Guide and complying with Section 31 25 00, Erosion Control. Comply with EPA Construction General Permit (CGP) standard 2012.
2. Contractor is responsible for completing the LEED online credit template and attaching the following information to the template:
   a. Provide record of compliance with Erosion and Sediment Control Plan:
      i. Monthly photographs of barriers and containment.
      ii. Monthly photographs of dust control measures
      iii. Records of inspections by agency in charge of overseeing compliance.
      iv. Include dust control measures
   b. Several early, a middle and several near end prevention plan checks and reports will be required as an upload to LEED Online – assume 6 checks and reports over the duration of the project.
3. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission.

3.3 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. MR Credits Building Product Disclosure Optimization – EPDs, Sourcing and Ingredients

1. Environmental Product Declarations – comply with one or both of the following Options:
   a. Option 1: Environmental Product Declarations (1 point)
   b. Option 2: Multi-Attribute Optimization (1 point) including products that demonstrate impact reduction below industry average in global warming potential, ozone depletion, acidification of land and water, eutrophication, tropospheric ozone, or other USGBC approved program.
2. Sourcing of Raw Materials – comply with one or both of the following Options:
   a. Option 1: Raw Material Source and Extraction Reporting (1 point)
   b. Option 2: Leadership Extraction Practices (1 point) including producer responsibility, bio-based materials, wood products, material reuse, recycle content or other approved USGBC program
3. Material Ingredients - comply with one or two of the following Options:
   a. Option 1: Material Ingredient Reporting (1 point)
   b. Option 2: Material Ingredient Optimization (1 point) including GreenScreen v1.2 Benchmark, Cradle to Cradle Certification, REACH Optimization or other approved USGBC program.
   c. Option 3: Product Manufacturer Supply Chain Optimization (1 point) including products from manufacturers with validated and robust safety, health, hazard and risk programs that document 99% by weight of the ingredients used to make the product.
4. Contractor to complete and submit the MR building product disclosure and optimization calculator, available with the project in LEED Online
5. Contractor to submit supporting documentation including EPD and LCA reports, corporate sustainability reports, product declarations, labels, REACH, GreenScreen Benchmark, LT scores or other compliance summary documents. LEED project administrator and/or GBCI may require revisions and additions to this documentation and Contractor should plan accordingly.
6. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission.

3.4 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING

A. MR Prerequisite and Credit: Comply with Division 1 Section “Construction Waste Management and Disposal”.

1. Contractor is required to create a Construction Waste Management Plan that includes:
   a. Establishing waste diversion goals for the project by identifying at least five material streams targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
   b. Specifying whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the material will be taken and how the recycling facility will process the material.
   c. A final report detailing all major waste streams generated, including disposal and diversion rates.
2. Contractor is required to meet the following minimum goal:
   a. Option 1 Path 1 – Divert 50% and three material streams (1 point) , Option 1 Path 2 – Divert 75% and four material streams, or

i. A material stream can be a specific material category that is diverted in a specific way or a mixture of several material categories that are diverted in a specific way.
ii. Best practice is that a material stream should constitute at least 5% (by weight or volume) of total diverted materials.
iii. Examples of material streams include Plastic, Carpet, Paper/Cardboard, Wood, metal, Sheetrock, Brick, Concrete, Shingles, deconstructed materials, commingled waste, reuse of deconstructed materials onsite, source separation where each material is sent to a specific facility or suppliers take-back of materials.

b. Option 2 – Do not generate more than 2.5 pounds of construction waste per square foot of the buildings floor area (2 points).

3. Contractor is responsible for completing the LEED online credit template. Attached documentation in support of the credit shall include:
   a. Monthly photographs of waste recycling sorting area including:
      i. Debris control fencing.
      ii. Signage clearly identifying the containers content.
   b. Spreadsheet containing the following information:
      i. Diverted materials description.
      ii. Diverted materials/waste hauler name.
      iii. Date of each haul.
      iv. Quantity of material in each haul.
   c. Copies of recycling vender and waste hauler tipping receipts.
4. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission.

3.5 ENHANCED INDOOR AIR QUALITY STRATEGIES

A. IEQ Credit – Enhanced Indoor Air Quality Strategies: Intent is to promote occupants comfort, well-being and productivity by improving indoor air quality.
   1. Install new air filtration media, with a MERV 13 Rating, in regularly occupied areas prior to occupancy.
   2. This is in addition to the set of filters required for the building flushout. These filters are to be installed after the flushout is completed.

3.6 LOW EMITTING MATERIALS

A. IEQ Credit - Low Emitting Materials: Intent is to reduce concentrations of chemical contaminants that can damage air quality, human health, productivity and the environment.
   1. Follow LEED instructions in LEED NCv4 Reference Guide.
   2. Contractor is required to complete and upload the following documentation to LEED Online:
      a. USGBC low-emitting materials calculator (available at the project resources in LEED Online)
      b. Product information (e.g., MSDS, third party certifications, testing reports, etc) for relevant materials
   3. Contractor is responsible for one of the following point options:
      a. Option 1: Product Category threshold compliance in 2 of the following categories (1 point), 4 of the following categories (2 points) or 5 of the following categories (3 points):
         i. Interior paints and coatings applied onsite: 90% by volume for emissions, 100% VOC content
         ii. Interior adhesives and sealants applied onsite (including flooring adhesive): 90% by volume for emissions and 100% for VOC content
         iii. Flooring: 100% emissions
         iv. Composite Wood: 100% emissions (separate Composite Wood Evaluation)
         v. Ceilings, walls, thermal and acoustic insulation: 100% emissions
         vi. Furniture: 90% by cost (separate Furniture Evaluation)
      b. Option 2: If some products in a category do not meet the criteria, use the Budget Calculation Method meeting >=50% and <70% (1 point), >=70% and <90% (2 points) or >=90% (3 points) in any of the following categories:
         i. flooring,
         ii. ceilings,
         iii. walls,
         iv. thermal and acoustic insulation or
         v. furniture

4. Composite Wood Evaluation - Composite wood, agrifiber products, and adhesives shall be made using ultra-low emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde. Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
5. Furniture Evaluation - New furniture and furnishing items must be tested in accordance with ANSI/BIFMA Standard Method M7.1–2011. Comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
6. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission. Revisions and time to answer review questions should be assumed.

3.7 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT PLAN

A. IEQ Credit Construction IAQ Management Plan: Intent is to promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation. Contractor to include at a minimum the following elements into the plan:
1. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
2. Prohibit the use of tobacco products inside the building and within 25 feet of the building entrances during construction.
3. Protect absorptive materials stored on-site and installed from moisture damage.
4. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 1 Section "Temporary Facilities and Controls", install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
5. Replace all air filters immediately prior to occupancy.

B. Provide record of compliance with Indoor Air Quality Management Plan:
a. Monthly photographs of equipment and ductwork protection.
b. Monthly photographs of filters used to protect air distribution and equipment.
c. Contractor's report documenting that MERV 8 filters were used to protect equipment during construction and filters meeting final design requirements were installed prior to occupancy.

3.8 INDOOR AIR QUALITY ASSESSMENT

A. IEQ Credit – Indoor Air Quality Assessment: Intent is to establish better quality indoor air in the building after construction and during occupancy.

B. Contractor is required to implement one of the following options:
1. Option 1, Path 1 (1 point): After construction ends, prior to occupancy and with all interior finishes and furniture installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and no higher than 80 deg F and a relative humidity no higher than 60 percent.
2. Option 1, Path 2 (1 point): If occupancy is desired prior to flush-out completion, with furniture installed, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space while maintaining an internal temperature of at least 60°F and no higher than 80°F and relative humidity no higher than 60%. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in IEQ Prerequisite 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three (3) hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.
3. Option 2 (2 points) - Air-Quality Testing: If the Contractor chooses to test for compliance with this credit following is required, including contracting with an industrial hygienist to conduct testing:
a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide".
b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

i. Formaldehyde: 27 ppb.
ii. Particulates (PM10): 50 micrograms/cu. m.
iii. Particulates (PM2.5): 15 micrograms/cu. m.
iv. Ozone: 0.075 ppm
v. Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
vi. Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde -*see supplement at end of this specification for table*
vii. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, samples are to be taken from the same locations as the first test.

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

4. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission.

3.9 SUPPLEMENT

A. The supplement listed below, up to "End of Section," is a part of this Specification:
1. Target CREL VOCs, Table 4-1 for Indoor Air Quality Testing

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

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

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

END OF SECTION

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SECTION 01 91 00
COMMISSIONING

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 0-2013, “The Commissioning Process”.
C. ASTM E2947-16: Standard Guide for Building Enclosure Commissioning
D. ASTM E2813-12: Standard Practice for Building Enclosure Commissioning
E. 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 (terminal units and air distribution systems)
B. Building Automation System (BAS) for the HVAC system
C. Domestic Hot Water
D. Plumbing Sewerage Systems (ejectors and sump pumps)
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. A sample checklist for an exhaust fan is provided at the end of this specification section.
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, and 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.

3.8 SAMPLE DOCUMENTS

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

END OF SECTION

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SECTION 01 95 01
MONITORING-BASED COMMISSIONING

PART 1 – GENERAL

1.1 SUMMARY

A. Purpose: This section includes general requirements that apply to implementation of monitoring-based commissioning (MbCx). MbCx is a component of the LEED v4.1 Rating System and the Commissioning Process. This process replaces the Measurement and Verification process that was used in the LEED v3 Rating System.

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. Cx - Commissioning
C. DHW - Domestic Hot Water
D. MbCx Monitoring-Based Commissioning
E. kW - Electric power read from utility meter
F. KWh - Electric energy consumption read from utility meter
G. Plug Loads – Electric power and consumption from wall receptacles

1.3 MECHANICAL CONTRACTOR RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MbCx activities including, but not limited to, the following:

1. Follow activities identified in the Cx Plan.
2. Coordinate connection of gas and DHW monitoring equipment with BAS.
3. Cooperate with the Cx Agent, owner, Electrical Contractor and Controls Contractor for resolution of issues related to data collection.
4. Attend team meetings during construction and post-construction MbCx period (1 year). Attend quarterly meetings.
5. Followup training or repairs needed to maintain performance.

1.4 ELECTRICAL CONTRACTOR RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MbCx activities including, but not limited to, the following:
   1. Follow activities identified in the Cx Plan.
   2. Coordinate connection of electrical monitoring equipment with BAS
   3. Cooperate with the Cx Agent, owner, Mechanical Contractor and Controls Contractor for resolution of issues related to data collection.
   4. Attend team meetings during construction and post-construction MbCx period (1 year). Attend quarterly meetings.
   5. Followup training or repairs needed to maintain performance.

1.5 CONTROLS CONTRACTOR RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MbCx activities including, but not limited to, the following:
   1. Follow activities identified in the Cx Plan.
   2. Coordinate connection of electrical monitoring equipment with BAS
   3. Coordinate connection of gas and DHW monitoring equipment with BAS.
   4. Coordinate connection of measurement requirements (points, data access) with BAS.
   5. Cooperate with the Cx Agent, owner, Mechanical Contractor and Electrical Contractor for resolution of issues related to data collection.
   6. Attend team meetings during construction and post-construction MbCx period (1 year). Attend quarterly meetings.
   5. Followup training or repairs needed to maintain performance.

1.6 MBCX PROVIDERS RESPONSIBILITIES

A. The Cx Agents responsibilities related to MbCx include:
   1. Organize and lead the MbCx team.
   2. Provide a Cx plan that includes the following procedures and information:
      a. roles and responsibilities as they relate to MbCx;
      b. measurement requirements (meters, points, metering systems, data access);
      c. the points to be tracked, with frequency and duration for trend monitoring;
      d. the limits of acceptable values for tracked points and metered values (where appropriate, predictive algorithms may be used to compare ideal values with actual values);
      e. the elements used to evaluate performance, including conflict between systems, out-of sequence systems components, and energy and water usage profiles;
      f. an action plan for identifying and correcting operational errors and deficiencies;
      g. training to prevent errors;
      h. planning for repairs needed to maintain performance; and
      i. the frequency of analyses in the first year of occupancy (at least quarterly).
   3. Convene MbCx meetings as needed, but at least quarterly for 1 year post construction.
   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 a final MbCx report at 1 year post construction.
   6. Update the systems manual with any modifications or new settings, and give the reason for any modifications from the original design.

PART 2 – PRODUCTS

2.1 METERS AND SUB-METERS

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

PART 3 - EXECUTION

3.1 ELECTRIC 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 ELECTRIC SUB-METERS

A. Provide real-time monitoring of the building electricity kW and kWh use by using a signal from the building panel sub-meters at each floor and provide the data input to the 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.

3.3 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.

3.4 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. 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.

3.5 HEATING HOT WATER

A. Provide real-time monitoring of the heating hot water (HW) system by measuring water flow to the boiler(s) and HW supply and return temperatures and providing data input to the BAS. The BAS must be capable of trending. 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.

3.6 CHILLED WATER

A. Provide real-time monitoring of the chilled water (CW) system by measuring water flow to the chillers(s) and CW supply and return temperatures and providing data input to the BAS. The BAS must be capable of trending. 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.

3.7 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

B. Temporary monitoring equipment will be provided by the Cx Agent.

3.8 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 per the MbCx requirements in the Cx Plan.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Salvaging items for reuse by Owner.

1.02 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

B. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 WORK THAT IS NOT IN CONTRACT (N.I.C.)

A. The Owner shall hire an Environmental Engineer to prepare a Hazardous Materials Survey consisting of both onsite testing and a report documenting results including all concealed materials.

B. Removal of Owners Parking Control Equipment including entry/exit barrier gates and payment kiosks.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.05 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2013.

1.06 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Interruption of utility services. Indicate how long utility services will be interrupted.
   2. Coordination for shutoff, capping, and continuation of utility services.
   3. Locations of proposed dust- and noise-control temporary partitions and means of egress.

B. Inventory: After demolition is complete, submit a list of items that have been removed and salvaged.

C. Predemolition Photographs: Record existing conditions by use of preconstruction photographs. Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. See Section 01 33 23 - Submittals, for submittal procedures.

G. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

H. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
      a. Submit Qualification Data for refrigerant recovery technician.

3. Include a summary of measures proposed for protecting individuals and property, for environmental protection, for dust control, for noise control, and safety procedures.

I. Project Closeout Documents:
1. Accurately record actual locations of capped and active utilities and subsurface construction.
2. Inventory: After demolition is complete, submit a list of items that have been removed and salvaged.
3. Post-demolition Photographs: After demolition, provide photographs taken at similar locations as each preconstruction photograph for comparison.

1.07 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
1. Minimum of 5 years of documented experience.
2. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Predemolition Conference: Conduct conference at Project site. Review methods and procedures related to building demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.08 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1.09 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Repair Materials:
1. Use repair materials identical to existing materials.
a. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
b. Use materials whose installed performance equals or surpasses that of existing materials.
2. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 EXECUTION

3.01 SCOPE

A. Remove entire building, site structures, curbs, paving, fencing, etc. as indicated on drawings.

B. Perform selective demolition to the existing buildings to remain as indicated on drawings.

C. Within area of new construction, remove entire depth of foundation walls and footings below finished grade.

D. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.

E. Remove concrete slabs on grade within construction limits indicated on drawings.

F. Remove all underground tanks within area of new construction.

G. Remove other items indicated, for removal from premises.

H. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.02 EXAMINATION

A. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

B. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.03 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Salvaged Items: Comply with the following:

1. Owner is responsible for removal and storage of salvaged items to be reused including but not limited to the following:
    a. Parking control equipment and pay kiosks.

3.04 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities and Controls." Maintain temporary protections until hazards no longer exist.

1. Protect adjacent buildings and facilities from damage due to demolition activities.
    a. Prevent movement of structure; provide shoring and bracing if necessary.
    b. Perform cutting to accomplish removals neatly and as specified for cutting new work.
    c. Repair adjacent construction and finishes damaged during removal work.
    d. Patch as specified for patching new work.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

4. Provide and maintain temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide and maintain protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Provide and maintain orange plastic security fences where required.
7. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

C. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.05 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted. (Demolition via explosions or implosions is prohibited.)
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permit.
8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be removed.
1. Provide and maintain interior and exterior temporary shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
a. Strengthen or add new supports when required during progress of demolition.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Hazardous Materials: Hazardous materials are present in building to be demolished.
1. A report on the presence of hazardous materials will be developed and provided for review and use. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.
2. Examine report to become aware of locations where hazardous materials are present.
3. Hazardous material remediation will be awarded as a separate contract, direct with Owner, and is not within this scope of work with the exception of the folowing:
a. See electrical sections for disposal of electrical lamps and ballasts.
b. For lead-lined gypsum board, doors, frames, etc. that was previously installed for radiation shielding purposes, lead must be protected from public contact for both environmental and health reasons. Removal contractors shall be trained in safe handling of lead and must

observe proper techniques for cleanup. Disposal of all scrap lead must be handled in an environmentally safe manner.

4. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
   2. Dismantle existing construction and separate materials.
   3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
   2. Maintain fire watch during and for time period after flame cutting operations as required by specific Wisconsin DHS examiner assigned to project.
   3. Maintain adequate ventilation when using cutting torches.
   4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

I. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

J. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.From MasterSpec
   1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
   2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.06 DEMOLITION BY MECHANICAL MEANS

A. Wrecking ball: Use of wrecking ball is prohibited. Demolish building via mechanical means using the “Pull-Over” method where the columns and bearing walls are weakened and then removed causing a controlled fall.

B. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

C. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

D. Salvage: Items to be salvaged are indicated on Drawings.

3.07 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Locate, identify, disconnect, and seal or cap off indicated existing utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
   3. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
   4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
   5. Utilities shall be disconnected between street Right-Of-Way and building face.
   6. Demolish and remove existing utilities and below-grade utility structures to be removed.
      a. Piping: Disconnect piping at unions, flanges, valves, or fittings.
      b. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.
   7. Refer to Divisions 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
   8. Demo contractor shall use existing hydrants for water required for removal operations.

H. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

I. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

J. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.08 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
   4. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
   5. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.09 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site via trucks, immediately.
   1. See Division 01 Section "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
   2. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
   3. Do not allow demolished materials to accumulate on-site.
   4. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.11 DEBRIS, WASTE REMOVAL, AND CLEANING

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requires set forth in 01 74 19 - Construction Waste Management and Disposal.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

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

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. This section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 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. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. 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 the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction joints, control joints, isolation joints, and joint-filler strips.
      c. Semirigid joint fillers.
      d. Vapor-retarder installation.
      e. Anchor rod and anchorage device installation tolerances.
      f. Cold and hot weather concreting procedures.
      g. Concrete finishes and finishing.
      h. Curing procedures.
      i. Forms and form-removal limitations.
      j. Shoring and reshoring procedures.
      k. Methods for achieving specified floor and slab flatness and levelness.
      l. Floor and slab flatness and levelness measurements.
      m. Concrete repair procedures.
      n. Concrete protection.
      o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
      p. Protection of field cured field test cylinders.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following.
   1. Portland cement.
   2. Fly ash.
   3. Slag cement.
   4. Blended hydraulic cement.
   5. Silica fume.
   6. Performance-based hydraulic cement
   7. Aggregates.
   8. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Color pigments.
10. Fiber reinforcement.
11. Vapor retarders.
12. Floor and slab treatments.
13. Liquid floor treatments.
14. Curing materials.
15. Joint fillers.
16. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Historical compressive strength results including statistical analysis in accordance with ACI 318 or compressive strength test results related to trial batch procedure.
4. Durability exposure class.
5. Maximum w/cm.
6. Calculated equilibrium unit weight, for lightweight concrete.
7. Slump limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Steel-fiber reinforcement content.
11. Synthetic micro-fiber content.
12. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
13. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
14. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
15. Intended placement method.
16. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings:

1. Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment, if any.

E. General contractor to submit a coordinated penetration plan (composite of all disciplines requiring penetrations through walls and slabs) two weeks prior to the issuance of construction documents.

F. Thermal Control Plan Submittal for the concrete placements greater than or equal to 48 inches thick or for placements containing greater than 660 lb/yd^3 cementitious material to be submitted by the general contractor and shall include the following:

1. Calculation of maximum concrete temperature to ensure that the maximum temperature will not exceed 158 degrees Fahrenheit with the specific concrete mix design.
2. Plan to ensure that a 35 degree Fahrenheit thermal gradient is not exceeded from the center to the exterior edge of the mat.
3. Thermal monitoring plan, including temperature gauges.
4. Insulation plan including anticipated duration of continuous insulation.
5. Dowel bar insulation plan.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:
1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:
   a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete.
1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
   1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
   1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, “Specification for Structural Concrete”
   2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials”

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1 .

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

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

B. Rough-Formed Finished Concrete: Plywood, Lumber, Metal, or another approved material. Provide lumber dressed on at least two edges and one side for a tight fit.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed. Reinforcing bars to be welded shall conform to ASTM A706.
   1. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

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

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

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

E. 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."
   1. For concrete surfaces exposed to view where legs of wire bar support 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.

F. Fabricate steel reinforcement according to CRSI’s “Manual of Standard Practice.”

G. Shear Stud Rail Reinforcement. As shown in plans and details.
   1. The shear studs shall be Low Carbon Steel, C1010 to C1020 in accordance with ASTM-A108. Minimum shear stud head area shall be 10 times greater than shear stud shaft area and minimum shear stud head thickness shall be 2/3 the shear stud shaft diameter. The strength and ductility requirements are:
      a. Yield strength: 50,000 psi minimum

b. Tensile strength: 60,000 psi minimum
c. Elongation in 2 in: 20% minimum
d. Reduction of Area: 50% minimum

2. The bottom rails shall be Low Carbon Steel Type 44W. Minimum rail width shall be 2.5 times the shear stud diameter and minimum rail thickness shall be 0.5 times the stud diameter. The strength and ductility requirements are:
   a. Yield strength: 44,000 psi minimum
   b. Tensile strength: 65,000 psi minimum
   c. Elongation in 8 in: 20% minimum
3. Shear stud rail assembly shall be welded in accordance with AWS D1.1. Provide chairs which securely hold shear stud rail assembly in vertical position and maintain proper concrete coverage during concrete placement.

2.03 CONCRETE, GENERAL

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

2.04 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C150/C150M, Type I/II Supplement with the following:
      a. Fly Ash: ASTM C618, Class C.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120

B. Silica Fume: ASTM C 1240, amorphous silica

C. Normal-Weight Aggregates: ASTM C 33 Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable

E. Air-Entraining Admixture: ASTM C260.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
   7. Crystalline waterproofing:
      a. Products: Xypex Admix C-500, Kryton Internal Membrane (KIM)
      b. Crystalline waterproofing powder shall be added to the concrete mix at time of batching at a rate of 2 percent to 3 percent by weight of Portland cement content.

2.05 FIBER REINFORCEMENT

A. Macrosynthetic fiber reinforcement: ASTM C1116, Type III, 1 ½" to 2 ½" long.

2.06 VAPOR BARRIERS

A. Vapor Barriers: Install ASTM E 1745 Class A not less than 10mil vapor barrier (minimum tensile strength = 50lbf/in) with permeance less than .01 perms after ASTM E 154 – Sections 8, 11,12, & 13 per manufacturers recommendations, include accessories (i.e. /seaming tape, mastic, etc.) required for a complete installation.

2.07 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

B. densifies concrete surfaces.

2.08 CURING MATERIALS

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

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

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
   1. Color:
      a. Ambient Temperature Below 50 deg F: Black.
      b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
      c. Ambient Temperature Above 85 deg F: White.

D. Water: Potable or complying with ASTM C1602/C1602M.

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

F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

H. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.09 RELATED MATERIALS

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

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.

2.10 CONCRETE MIXTURES

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.

Type of construction	28 day strength (psi) (ASTM C39)	Exposure Categories, reference ACI 318	Percent of air entraining +/- 1-1/2%	Maximum water/cementitious material ratio
Footings	Refer to Plans	F0	--	--
Frost walls	Refer to Plans	F1	5	0.55
Basement Walls	Refer to Plans	F1	--	0.55
Interior Walls	Refer to Plans	F0	--	--
Exterior Walls	Refer to Plans	F2	6	0.45
Interior Columns/ Interior Shearwalls	Refer to Plans	F0	--	--
Exterior Columns/ Exterior Shearwalls	Refer to Plans	F2	6	0.45
Interior Parking Slab on Grade	Refer to Plans	C2	--	0.40
Exterior Slab on Grade	Refer to Plans	F3/C2	6	0.40

Elevated Interior Non-Parking Slabs and Beams	Refer to Plans	F0	--	--
Elevated Interior Parking Slabs and Beams	Refer to Plans	C2	--	0.40
Elevated Exterior Slabs and Beams	Refer to Plans	F3/C2	6	0.40
Interior Concrete Topping and Stair Landings/Treads	Refer to Plans	F0	--	--
Exterior Concrete Topping and Stair Landings/Treads	Refer to Plans	F3/C2	6	0.40
Slabs on Metal Deck	Refer to Plans	F0	--	--
Lean Concrete	Refer to Plans	F0	--	--

B. General Notes:

1. Corrosion exposure to be C0 unless noted otherwise in the Exposure Category column.
2. Maximum aggregate size for all mixes to be ¾ inches; footings may be 1 ½ inches.
3. Concrete supplier and finisher shall coordinate approximate set times of proposed mix design under various weather conditions and adjust mix design as necessary to assure set time is acceptable to complete placing and finishing of slab in a timely manner. Slump may be increased when chemical admixtures are used, provided that the admixture treated concrete has the same or lower water-cement ratio and does not exhibit segregation potential or excessive bleeding,
4. Concrete supplier, in concert with the general contractor, to provide concrete mix such that the maximum temperature will not exceed 158 degrees Fahrenheit. Likewise, a thermal gradient (from the center to the edge of the concrete placement) that exceeds 35 degrees Fahrenheit is not permitted.
5. Provide 5% Air Entrainment at all exposed conditions not explicitly indicated above.
6. Columns integral with walls shall match strength specified in column schedule
7. For Exposure Category F3, maximum percent of total cementitious materials by mass as follows:
   a. Fly Ash or other pozzolans conforming to ASTM C618 – 25%
   b. Slag cement conforming to ASTM C989 – 50%
   c. Silica fume conforming to ASTM C1240 – 10%
   d. Total of fly ash or other pozzolans and silica fume – 35%
   e. Total of fly ash or other pozzolans, slag cement, and silica fume – 50%
8. For concrete floor slabs and toppings, the minimum cementitious material content is 540 lbs/yd^3 unless approved by engineer of record.
9. A target slump for each mix is to be determined by the general contractor/mix designer. The target slump shall not exceed 9 inches.

2.11 CONCRETE MIXING

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

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

3.03 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), 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 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces
   2. Class B, 1/4 inch for rough-formed finished surfaces

D. Chamfer exterior corners and edges of permanently exposed concrete.

3.04 INSTALLATION OF EMBEDDED ITEMS

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.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
   3. 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.

3.05 INSTALLATION OF VAPOR RETARDER

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

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

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture under-slab waterproofing or vapor barrier. Repair damage and reseal before placing concrete.

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

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing to reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, 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 od adjoining sheets at least one mesh spacing. Offset laps of adjoining sheets widths to prevent continuous laps in either direction. Lace overlaps with wire.

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

3.07 JOINTS

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

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.
      a. Continue reinforcement across construction joints unless otherwise indicated.
   3. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form control 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 cracks.

D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
   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 079200 "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.

3.08 WATERSTOPS

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

3.09 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. 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.
1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
   a. Do not use vibrators to transport concrete inside forms.
   b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
   c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
   d. 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.

F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. General: After removal of forms, give each formed surface one or more of the finishes described below. When Contract Documents do not specify a finish, finish surfaces as required by Unspecified Finishes.

B. As-Cast Finishes: Coordinate finishes of all "as-cast" concrete finishes with construction of formwork. Produce as-cast form finishes in accordance with the following requirements:
1. Rough-Form Finish: Patch tie holes and defects. Chip or rub off fins exceeding 1/2 inch in height. Leave surfaces with the texture imparted by the forms.
2. Smooth-Form Finish: Patch tie holes and defects. Remove fins exceeding 1/8 inch in height. Leave surfaces with the texture imparted by the forms.
3. Architectural Finish: Patch tie holes and defects and remove fins. Produce architectural finishes as specified in the Contract Documents.

C. Exposed underside slab finish in units: Grade B minimum

D. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Patch tie holes and defects and remove fins. Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Patch tie holes and defects and remove fins. Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Patch tie holes and defects and remove fins. Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

E. Unspecified Finishes: When a specific finish is not specified in Contract Documents for a concrete surface, apply the following finishes:
1. Rough-form finish on concrete surfaces not exposed to public view.
2. Smooth-form (smooth rubbed) finish on concrete surfaces exposed to public view.

F. 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. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces indicated and surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. 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:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. 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.

7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
   a. Slabs on Ground:
      1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
   b. Suspended Slabs:
      1) Specified overall values of flatness, FF 25; and of levelness, FL 20; with minimum local values of flatness, FF 17; and of levelness, FL 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings 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 perpendicular to main traffic route.
   1. Coordinate required final finish with Architect before application.
   2. 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 locations indicated on Drawings.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
   2. Coordinate required final finish with Architect before application.

3.12 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

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

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

3.13 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
   3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations with an evaporation retarder. Apply according to manufacturer's written instruction after placing, screeding, and bull floating or dabrying concrete, but before float finishing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
   2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
   3. If forms remain during curing period, moist cure after loosening forms.
   4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
      b. Continuous Sprinkling: Maintain concrete surface continuously wet.
      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
      d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
      e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
(a) Lap edges and ends of absorptive cover not less than 12 inches.
(b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
2) 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.
(a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
(b) Cure for not less than seven days.
3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
(a) Water.
(b) Continuous water-fog spray.
b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
(a) Lap edges and ends of absorptive cover not less than 12 inches.
(b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
2) 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.
(a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
(b) Cure for not less than seven days.
3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
(a) Water.
(b) Continuous water-fog spray.
c. Floors to Receive Polished Finish: Contractor has option of the following:
1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
(a) Lap edges and ends of absorptive cover not less than 12 inches.
(b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
(a) Water.
(b) Continuous water-fog spray.
d. Floors to Receive Chemical Stain:
1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.

2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
3) Butt sides of curing paper tight; do not overlap sides of curing paper.
4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:
1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
2) Rewet absorptive cover and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:
1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:
1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.14 TOLERANCES

A. Conform to ACI 117.

3.15 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with 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 seven days' old or as recommended by the manufacturer.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.16 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least three month(s).
2. 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.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.17 CONCRETE SURFACE REPAIRS

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

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
      a. Limit cut depth to 3/4 inch.
      b. Make edges of cuts perpendicular to concrete surface.
      c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
      d. Fill and compact with patching mortar before bonding agent has dried.
      e. 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.
      a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
      b. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:
   1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
      a. Correct low and high areas.
      b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, cracks and other conditions that are deemed unacceptable by the structural engineer or architect.
   3. After concrete has cured at least 14 days, correct high areas by grinding.
   4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
      a. Finish repaired areas to blend into adjacent concrete.
   5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
      a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
      b. Feather edges to match adjacent floor elevations.
   6. Correct other low areas scheduled to remain exposed with repair topping.
      a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
      b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
      a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
      b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
      c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
      d. Place, compact, and finish to blend with adjacent finished concrete.

e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
   b. Dampen cleaned concrete surfaces and apply bonding agent.
   c. Place patching mortar before bonding agent has dried.
   d. Compact patching mortar and finish to match adjacent concrete.
   e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

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

3.18 FIELD QUALITY CONTROL

A. Special Inspections: When required by local jurisdiction, owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
   1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
   2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
   3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
      a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
         1) Project name.
         2) Name of testing agency.
         3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
         4) Name of concrete manufacturer.
         5) Date and time of inspection, sampling, and field testing.
         6) Date and time of concrete placement.
         7) Location in Work of concrete represented by samples.
         8) Date and time sample was obtained.
         9) Truck and batch ticket numbers.
         10) Design compressive strength at 28 days.
         11) Concrete mixture designation, proportions, and materials.
         12) Field test results.
         13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
         14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. 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.
8. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 100 cu. yd. or fraction thereof.
   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 C143/C143M:
   a. 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.
   b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
   a. 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.
   b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
   a. 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.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or two sets of three 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of two 6-inch or three 4-inch laboratory-cured specimens at seven days and one set of two 6-inch or three 4-inch specimens at 28 days.
   b.
   c. Test one set of two 6-inch or three 4-inch field-cured specimens at seven days and one set of two 6-inch or three 4-inch specimens at 28 days.
   d. 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.
9. 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.
10. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
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:

a. 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.
b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, Section 1.6.6.3.

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.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.19 PROTECTION

A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. 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.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid densifiers and hardeners.

B. Clear coatings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 30 00 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

C. Section 03 38 00-Post-Tensioned Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

D. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature of 50 degrees F minimum.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Liquid Densifier and Hardener:

1. Use at following locations: All concrete floors in interior finished spaces where sealed concrete is indicated in the finish schedule on the drawings, and not scheduled to receive a finish floor material.

B. Slip Resistant Coating: Finely-ground aggregates added to coatings.

2.02 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.

1. Composition: Sodium silicate.
2. Products:
   a. Concrete Sealers USA; PS107: www.concretesealersusa.com/#sle.
   b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; SEAL HARD: www.lmcc.com/#sle.

c. W. R. Meadows, Inc; Liqui-Hard: www.wrmeadows.com/#sle.

2.03 COATINGS

A. Clear Coating: Clear coating recommended by manufacturer for finishing concrete floors and slabs.
1. Type: High solids polyurethane; two-component.
2. Gloss: Matte.
3. Products:
a. SureCrete Design Products; DK 400: www.surecretedesign.com/#sle.
b. H & C Concrete; Clearprotect: www.hcconcrete.com.

B. Plastic Aggregate: Finely ground polymer for addition to coatings for slip resistance.
1. Products:
a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
b. Euclid Chemical Company; EUCO GRIP: www.euclidchemical.com/#sle.
c. SpecChem, LLC; Surface Grip: www.specchemllc.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions.

END OF SECTION

SECTION 03 38 16
UNBONDED POST-TENSIONED CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Post-tensioning tendons and accessories, including pocket formers, bar chairs, slab bolsters, and nonprestressed reinforcement required for installing post-tensioning tendons, including the following:
      a. Support bars.
      b. Backup bars and hairpins at anchorages.
      c. Hairpins at locations of horizontal curvature.
      d. Supplemental reinforcement at blockouts.
   2. Post-tensioning operations, including stressing, recording tendon elongations and gage pressures, and finishing tendons.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for concrete.

1.03 DEFINITIONS

A. Strand Tail: Excess strand length extending past the anchorage device.

B. Stressing Pocket: Void formed by pocket former at stressing-end anchorage that provides 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.

1.04 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/Engineer.
   3. Form penetrations within 18 inches of an anchorage with ASTM A53/A53M, Schedule 40 steel pipe.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project site.
   1. Review 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. Horizontal and vertical tolerances on tendons and nonprestressed reinforcement placement.
      f. Marking and measuring of elongations.
      g. Submittal of stressing records and requirements for tendon finishing.
      h. Removal of formwork.

1.06 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: Prepared by or under the supervision of a qualified professional engineer, detailing tendon layout, installation procedures, and the following:
   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. Details for horizontal curvature around openings and at anchorages.
   5. Locations of anchorages and blockouts required for stressing.
   6. Anchorage details, including bundled tendon flaring.
   7. Tendon clearances around slab openings and penetrations.
   8. Construction joint locations and pour sequence.
   9. Details for corners and other locations where tendon layouts may conflict with one another or with nonprestressed reinforcing steel.
   10. 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.
   11. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
   12. Calculated elongations for each tendon.

C. Delegated Design Submittal: For post-tensioning system.
   1. Include sealed design calculations prepared by a qualified structural engineer indicating method of elongation calculation, including values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, and shrinkage.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer. Include resume of individual supervising installation and stressing of post-tensioning tendons.

B. Evaluation Reports: For each type of anchorage device and coupler, from ICC-ES:

C. Product Certificates: 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.

1.08 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 to be trained by post-tensioning supplier in the operation of stressing equipment to be used on Project.

C. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations to have successfully completed PTI's Level 1 - Field Fundamentals course or to have equivalent verifiable experience and knowledge acceptable to Architect.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

PART 2 PRODUCTS

2.01 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.

2.02 PRESTRESSING TENDONS

A. ACI Publications: Comply with ACI 423.7 unless otherwise indicated.

B. Prestressing Strand: ASTM A416/A416M, 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 strand, 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. Material: Polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in.
2. Minimum Thickness: 0.050 inch.
3. Continuous over length of tendon to provide watertight encapsulation of prestressing strand and between anchorages to prevent intrusion of cement paste or loss of coating.

E. Anchorage and Coupler Assemblies: Assemblies of prestressing strand, wedges, and anchor 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 423.7 for stresses at transfer load and service load.
2. Fixed-End Anchorage 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. Encapsulation Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
a. Encapsulation Caps for Fixed- and Stressing-End Anchorages: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.

Attach encapsulation caps for fixed-end anchorages in fabricating plant.
b. Encapsulation Caps at Intermediate Anchorages: Open to allow passage of strand.
2. Sleeves: Attached to anchorage with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.

2.03 NONPRESTRESSED STEEL BARS

A. Support Bars, Reinforcing Bars, and Hairpins:
1. Steel: ASTM A615/A615M, Grade 60, deformed.
2. Low-Alloy Steel: ASTM A706/A706M, deformed.
3. Galvanized Steel: ASTM A615/A615M, Grade 60, deformed bars, ASTM A767/A767M, Class I zinc coated after fabrication and bending.
a. Zinc Repair Material: ASTM A780/A780M, zinc-based solder, paint containing zinc dust, or sprayed zinc.
4. Epoxy-Coated Steel: ASTM A615/A615M, Grade 60, deformed bars, ASTM A775/A775M 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 A775/A755M. After fabricating bars, repair damaged areas according to ASTM D3963/D3963M.

B. 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.

2.04 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: Stainless or Galvanized-steel nails, wires, and screws used to attach anchorages to formwork.

C. Sheathing Repair Tape: Elastic, self-adhesive, moisture proof tape with minimum width of 2 inches, in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Adhesive Tape Products, Inc.; PWT-20.
b. 3M; Tape 226.
c. Tyco Adhesives; Polyken 826.

2.05 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.

PART 3 EXECUTION

3.01 FORMWORK

A. 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 Structural Engineer.

C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by Structural Engineer.

3.02 INSTALLATION OF NONPRESTRESSED STEEL REINFORCEMENT

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.

3.03 INSTALLATION OF TENDONS

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 423.7 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. 1/4 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 center of adjacent bundles.

F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs. Obtain Structural Engineer’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 Anchorages:
   1. Place anchorages at locations shown on approved installation drawings.
   2. Do not switch fixed- and stressing-end anchorage locations.
   3. Attach pocket formers, intermediate anchorages, and stressing-end anchorages securely to bulkhead forms. Install stressing-end and intermediate anchorages 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 anchorages in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
8. Remove loose encapsulation caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach encapsulation caps to achieve a watertight enclosure.

I. Maintain minimum concrete cover as follows:
1. From Exterior Edge of Concrete to Wedge Cavity: 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 Anchorages: 1-1/2 inches.

J. Maintain minimum clearance of 6 inches between tendons and openings. Maintain minimum clearance of 6 inches between tendons and parallel edges of slab.

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 Structural Engineer.

3.04 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 sheathing repair tape to prevent contact with concrete.

C. Immediately remove and replace tendons that have damaged strand.

3.05 CONCRETE PLACEMENT

A. Do not place concrete until placement of tendons and nonprestressed-steel reinforcement has been inspected by special inspector, testing agency and/or Structural Engineer.

B. Provide Structural Engineer, special inspector and/or testing agency a minimum of 48 hours' notice before concrete placement.

C. Ensure compaction of concrete around anchorages.

D. Ensure that position of tendons and nonprestressed-steel reinforcement do 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.

3.06 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 compressive strength has reached 3000 psi as indicated by tests of field-cured cylinders.

D. Complete stressing within 72 hours of concrete placement.

E. If concrete has not reached required compressive strength, obtain Architect's approval to partially stress tendons and delay final stressing until concrete has reached required strength.

F. Stage stress transfer girders, transfer slabs or foundation mats 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 Structural Engineer.

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, perform additional testing, restressing, strengthening, or replacing of affected elements unless otherwise approved by Structural Engineer.

L. Stressing Records: Testing agency records 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 according to supplied calibration chart.
11. Tendon identification mark.
12. Calculated tendon elongation.
13. Actual tendon elongation.
14. Actual gage pressure.

3.07 TENDON FINISHING

A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Structural Engineer.

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 encapsulation caps and sleeves on intermediate anchorages within one day of stressing.

E. Cut strand tails and install encapsulation caps on stressing-end anchorages within one day of Structural Engineer’s acceptance of elongations.

F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of stressing pocket to remove laitance or post-tensioning coating before installing patching material. Finish patching material flush with adjacent concrete.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Before concrete placement, special inspector and/or testing agency 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 and/or Testing agency will record tendon elongations during stressing.
   3. Special inspector and/or Testing agency will immediately report deviations from the Contract Documents to Structural Engineer.

B. Prepare test and inspection reports.

3.09 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 Structural Engineer for evaluation and approval.

B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Structural Engineer.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

B. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

C. Section 07 25 11 - Weather Barriers Fire-Retardant Fluid-Applied: Water-resistive barriers applied to exterior face of backing sheathing, concrete, or unit masonry substrate.

D. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

E. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A36/36M - Standard Specification for Carbon Structural Steel; 2014.

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

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire 2015.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement 2015.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2009a (Reapproved 2014).

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

I. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement 2011.

J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2015.

K. ASTM C55 - Standard Specification for Concrete Building Brick; 2017.

L. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

M. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2018.

N. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units 2014.

O. ASTM C91/C91M - Standard Specification for Masonry Cement 2012.

P. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units 2011.

Q. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units 2014.

R. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2011.

S. ASTM C150/C150M - Standard Specification for Portland Cement 2015.

T. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

U. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.

V. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2014a.

W. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2011.

X. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

Y. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2018a.

Z. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

AA. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength 2013.

BB. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

CC. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.

DD. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength; 2009.

EE. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014a.

FF. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

GG. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls 2017.

HH. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

II. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

JJ. UL (FRD) - Fire Resistance Directory current edition.

KK. Adopted Edition of International Building Code with All Adopted State Modifications.

LL. NFPA 285 – Standard Fire Test Method For Evaluation Of Fire Propagation Characteristics Of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

A. See Section 01 33 29-General Sustainable Requirements.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, and each type of product indicated.
   1. Submit the masonry manufacturer's recommendations for cleaning each masonry type used for this work, along with a written description of the Contractor's proposal for the masonry cleaning procedures.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
   1. Include calculations or selections from the manufacturer's prescriptive design tables that indicate compliance with the applicable building code and project conditions.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.

D. Samples: Submit two samples of decorative block, facing brick, and precast concrete trim units and each mortar color to illustrate color, texture, and extremes of color range.

E. Shop drawings:

1. Indicate bar sizes, spacings, clearances, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, and accessories.
2. Detail bending and placement of unit masonry reinforcing bars.
3. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
4. Show elevations of reinforced walls.
5. Design and engineer anchorage for precast concrete trims and precast concrete caps. Submit detailed layout drawings and anchorage details to other construction.

F. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

G. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

H. Design Mix Data for Mortar: Submit design mix including mix proportions, sources of aggregates, required environmental conditions, and admixture limitations.

I. Design Mix Data for Grout: Submit design mix including mix proportions, sources of aggregates, required environmental conditions, and admixture limitations.

J. Test Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270, component mortar materials to requirements of ASTM C270 and test and evaluation reports to ASTM C780 for aggregate ratio and water content, air content, consistency and compressive strength.

K. Test Reports: Submit reports on grout indicating conformance of grout to property requirements of ASTM C476, component grout materials to requirements of ASTM C476 and test and evaluation reports per referenced standard.

L. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Decorative CMU Units: 50 of each type, size, and color combination for field color CMU and 25 for accent color CMU.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
1. Maintain one copy of each document on project site.

C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of experience.

1.06 MOCK-UPS

A. Before placing order of masonry materials, build mockups to verify selections made under sample Submittals, and to demonstrate aesthetic effects and qualities of materials and execution. For compliance with construction schedules and lead times of materials, proceed with mock-ups for each building at the earliest possible time. Final colors are not to be considered approved until a mock-up is completed and approved by the Owner. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups for typical exterior walls, approximately 8’-0” long by 8’-0” high by full thickness including structural backup, all masonry and mortar types, window flashing, base of wall flashing, accessories, and a sealant-filled joint at least 16 inches long in each mockup.

2. Clean exposed faces of mockups with masonry cleaner as indicated.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
6. Locate where directed.
7. Mock-up may not remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle materials in a manner to prevent breakage and chipping. When stored on the site, materials shall not be in contact with the ground, shall be kept clean, and shall be covered with a waterproof, stain-proof cover. All excess masonry shall be removed from the job site.

C. All masonry units delivered for use in freezing weather shall be fully protected by a weather- tight covering to prevent accumulation of ice on the units. Loose board covering shall not be permitted.

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

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

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

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide nonstandard blocks configured for corners.
3. Load-Bearing Units: ASTM C90, normal weight.
    a. Hollow block, as indicated.
    b. Exposed Faces: Manufacturer's standard color and texture at locations not specified to be decorative CMU (Ground-Faced Units), and backup block behind a decorative CMU Veneer where indicated on drawings.
4. Nonloadbearing Units: ASTM C129.
    a. Hollow block, as indicated.
    b. Lightweight.
5. Ground-Faced Units: ASTM C90, hollow block with honed faces
    a. Application: Where indicated as “Decorative” CMU on drawings.
    b. Aggregates shall comply with ASTM C33
    c. Integral water repellent: Polymeric liquid admixture added to concrete masonry units at the time of manufacture.
    d. Sealer: factory sealed with a VOC compliant water based acrylic resin sealer and conforms to ASTM C-744
        1) Field apply a second coat of sealer after final cleaning.

e. Manufacturer: County Materials: www.countymaterials.com; Premium Ultra with TK Bright Kure & Seal.
f. Field Color: Galaxy 63-239C
1) Finish all exposed faces.
g. Accent Color: Manawa 63-292C
1) Finish all exposed faces.
h. Size: Standard units with nominal face dimensions of 16 by 8 inches.
i. Factory installed insulation inserts where enclosing tempered/heated space.
j. Application: Install where decorative CMU or Burnished Block is indicated on drawings including but not limited to single wythe exterior walls, and where a decorative CMU veneer is indicated.

6. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.
a. Performance of Units with Integral Water Repellent:
1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
(a) No water visible on back of wall above flashing at the end of 24 hours.
(b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
(c) No more than 25 percent of wall area above flashing visibly damp at end of test.
2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
b. Use only in combination with mortar that also has integral water repellent admixture.
c. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

7. Standard Units with Factory-Installed Insulation Inserts: ASTM C90, normal weight.
a. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
b. Insulation Type: Manufacturer's standard expanded polystyrene (XPS).
c. Exposed Faces: Color and texture to match Architect's sample.

2.02 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.
1. Colored mortar: Premixed cement as required to match Architect's color selections.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
1. Performance of Mortar and Grout with Integral Water Repellent:
a. Water Permeance: When tested per ASTM E514 for a minimum of 72 hours.
1) No water visible on back of wall above flashing at the end of 24 hours.

2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
3) No more than 25% of wall area above flashing visibly damp at end of test.

b. Flexural Bond Strength: ASTM C1357; minimum 10% increase.
c. Compressive Strength: ASTM C1314; maximum 5% decrease.
d. Drying Shrinkage: ASTM C1148; maximum 5% increase in shrinkage.

2. Use only in combination with masonry units manufactured with integral water repellent admixture.
3. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
4. Meet or exceed performance specified for water repellent admixture used in masonry units.

H. Cold Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C and recommended by the manufacturer for use in masonry mortar of composition indicated. Do not use calcium chloride in mortar or grout. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
1. Accelguard 80; Euclid Chemical Co.
2. Morseled; W.R. Grace & Co., Construction Products Division.
3. Trimix-NCA; Sonneborn, Div of ChemRex, Inc.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed bars; galvanized.

C. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

E. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder. Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

F. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

G. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.

2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches.
5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A153/A153M, Class B-2.
1. Description: Single screw veneer tie for metal stud construction with dual -diameter barrel with factory installed EPDM washers to seal both the face of the insulation and the air-barrier.
   a. Wire ties: 2-Seal BYNA-LOK.
      1) 3/16-inch diameter.
      2) Hot dip galvanized to ASTM A153/A153M.
   b. 1-1/2 Diameter washer has been independently tested for ASTM E331 & ASTM 2357 performance standards, seals insulation and helps secure insulation to back-up; reduces penetrations caused by insulation fasteners.
   c. Self-drilling, self-tapping, corrosion resistant, #12 Screw integrated into the double barrel.
      1) 1000-hour Polymer coating.
      2) No less the 743 pounds tension allowable for 16 gage studs.
   d. Vertical adjustment: Not less than 2 inches.
   e. Manufacturer's / Products:
      1) Hohmann & Barnard, Inc. / 2-Seal Tie for applications with gypsum sheathing and steel stud back-up.
      2) No Substitutions.
2. Frequency: At minimum, locate one tie every 1.78 square feet of masonry veneer. (equivilent to 16-inches on center in each direction)

2.04 FLASHINGS

A. Flexible Flashing Basis of Design: York 304 Self Adhering, 2-mil flexible, stainless steel.
1. Acceptable alternate manufacturers subject to complaince with requirements:
   a. GE Silicones, Inc.; GE Elemax SS Flashing.
   b. Vapro Shield, Inc.; VaproThru-Wall Flashing SA.
2. Description:
   a. Type: stainless steel core with one uncoated (bare) stainless steel face (outward facing) with a butyl block copolymer adhesive (inward facing).
3. Stainless steel: type 304, ASTM A240.
   a. Certify the use of domestic manufactured stainless steel for flashing.
      1) Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009
4. Adhesive: block copolymer.
   a. No primer required.
5. UV resistant.
6. Fire resistant: ASTM E84 Class A material.
7. Mold resistant: passes ASTM D3273.
8. Passes AAMA 711-20.
9. Passes air barrier material test: ASTM E2178-13.
10. Size: Manufacturer's standard width rolls as required to suit installation in accordance with manufacturers instructions.
11. Performance Attributes:
    a. Puncture: 2,500 psi per ASTM E154.
    b. Tensile: 90,000 psi minimum per ASTM D412.

c. When tested as manufactured, the product resists the growth of mold pursuant to test method ASTM D3273

12. Warranty:
    a. 20 years.
13. Applications: Overlap drip edge at least 1-inch.
    a. Through-wall flashing.
    b. Head flashing.
14. Splice material: Basis of Design is York 304 SA SS by York Manufacturering, standard self-adhered metal material; material matching manufacturers system material.
15. Polyether sealant basis of design: York Manufacturing, Inc.; UniverSeal US-100.
    a. Acceptable alternate manufactuers subject to compliance with requirements:
        1) STS Coatings; GreatSeal LT-100.
        2) Prosoco, Inc.; R-Guard Joint Seam Sealer.

B. Termination Bar:
1. Manufacturer: Hohmann & Barnard, Inc.
2. Product: H & B T2-FTS (Foam-Tite Seal) - Stainless Steel Termination Bar.
    a. Fasteners: Domestic manufactured fastener types and sizes recommended by flashing manufacturer for intended use.

C. Sealant at Termination Bar: Dow Corning 791 Silicone Sealant.
1. Applications:
    a. At top of termination bar.
    b. Continuous bead of concealed flashing overlapping drip edge.
    c. Set drip edge in continuous bead of sealant.
    d. Additional continuous bead below drip edge.

D. Stainless Steel Drip Edge Flashing: ASTM A666, Type 304, soft temper; 26 guage thick; with 3-inch leg and 5/16-inch hem at 45 degrees typical, unless indicated otherwise. Do not purchase products manufactured, or sold by vendors from, outside the United States.
1. Set drip edge flashings in continuous bead of sealant and seal under drip.

2.05 ACCESSORIES

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

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

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

D. Proprietary Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

E. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
    a. Manufacturers:
        1) Mortar Net USA, Ltd; Product 90% open mesh: www.mortarnet.com.

F. Cavity Weeps and Vents: Polyester mesh.

G. Flashing - Weep - Vent System: Polypropylene pan and bridge unit with polyester mesh drainage mats and bug guards.
   1. Application: Single wythe CMU flashing-weep-vent system at base of wall, lintel, and other Horizontal breaks.
   2. Wall system size: As indicated on drawings for single wythe wall thickness.
   3. Manufacturer: Mortar Net Solutions; BlockFlash: www.mortarnet.com/#sle.

H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type M.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.
      a. Low-alkali, non-staining cement mortar shall be used. Sand shall be clean, sharp, and washed free of loam, silt and vegetable matter. White sand shall be used.
   4. Interior, loadbearing masonry: Type N.
   5. Interior, non-loadbearing masonry: Type N.

B. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Minimum compressive strength of grout shall be 3000 pounds per square inch at 28 days of age. Make, cure and determine strength of grout test prisms in accordance with ASTM C1019.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that impair mortar bond.
   5. Verify that field conditions are acceptable and are ready to receive masonry.
   6. Verify that related items provided under other sections are properly sized and located.
   7. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 INSTALLATION, GENERAL

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

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

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

D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

3.06 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

L. Joints in precast concrete caps and tops of precast concrete trim:
   1. Rake joints back for installation of sealant per Section 07 92 00 - Joint Sealants.

3.07 LAYING MASONRY WALLS

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

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

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

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

E. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

F. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inchclearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
   3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section "Fire-Resistant Joint Systems."

3.08 LAYING CONCRETE MASONRY UNITS

A. Do not dampen units before laying. Do not lay units, which have surface water or contain frost. Lay only whole sound units with undamaged faces, corners, edges, and that are free from any other defect.

B. Lay units plumb, level, and true to a line with uniform horizontal and vertical joints; running bond or as indicated on the Drawings. Provide specialty units as required to complete the Work.

C. Lay first course of masonry in full mortar bed. Lay additional courses in full mortar bed on shell surface and at ends. Lay concrete brick, soaps, or plugs in full mortar bed with head and edge joints completely filled.

D. Lay hollow units with the thicker edge of the face shell up. Lay corners prior to laying mid-span. Rock closure units into place with the head joints shoved against the adjacent in-place units.

E. Cut units with power saw to insure straight and true cut edges. Do not use partial masonry units where whole units can be used. Use corner masonry units at all corners and perimeter of all openings, blocks with open cells exposed shall not be permitted.

F. Avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after setting in place. Where adjustment must be made after initial setting, remove mortar and replace with fresh mortar.

G. Protect all projecting surfaces from droppings of mortar. Protect doorjambs, corners, and other embedded items from damage during construction.

H. Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned so as to obtain the best possible bond with the new work. All loose masonry and mortar shall be removed. If it becomes necessary to "stop-off" a horizontal run of masonry, this shall be done only by raking out the mortar joint one-half length in each course and, if grout is used, stopping grout four inches back of the rack.

I. Keep face of masonry work free from excess mortar while laying block. Brush masonry work with dry fiber brush daily.

3.09 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

C. Install Flashing - Weep - Vent System in accordance with manufacturers installation instructions.

3.10 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.11 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
   1. Install horizontal joint reinforcing 8 inches on center at parapets.
   2. Place continuous joint reinforcement in first and second joint below top of walls.
   3. Reinforce soldier coursing, stack bonded unit with horizontal joint reinforcement 8 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce joint corners and intersections 16 inches o.c.
   1. Reinforce soldier coursing, stack bonded unit joint corners and intersections with strap anchors 8 inches on center.

3.12 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.13 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.14 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry, or turn up flashing ends at least 1 inch minimum to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing, or 4" minimum above mortar diverter, whichever is greater:
   1. Anchor vertical leg of flashing into backing with a termination bar and sealant.

C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

D. Extend flexible flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge or flat drip flush with face of veneer as illustrated.

E. Support flexible flashings across gaps and openings.

F. Fold ends of flashing at the end of the opening to form dam; seal with polyether sealant or use purchased manufacturers preformed end dams.

G. Inside and outside corners: Make in an industry-accepted manner using corner and splice material or purchase manufactured corners from the manufacturer.

3.15 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
   2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
   3. Openings over 78 inches: Reinforce openings as detailed.
   4. Do not splice reinforcing bars.
   5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
   6. Place and consolidate grout fill without displacing reinforcing.
   7. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8 inch bearing on each side of opening, unless noted as more on structural drawings.

3.16 GROUTED COMPONENTS

A. Reinforce bond beams, columns, and pilasters as scheduled on structural drawings.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.17 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Space control joints in concrete masonry at maximum 20 ft. on center maximum, at a maximum of 4 ft. from corners, at inside corners, and as indicated on drawings.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joint in accordance with Section 07 92 00 for sealant performance.

E. Concrete Masonry Units
   1. Locate control joints as indicated on the Drawings but do not to exceed 20 feet on centers, at a maximum of 4 feet from corners, and at inside corners.
   2. Extend control joint through bond beams unless otherwise indicated on the Drawings.
   3. Control joints on outside face of an exterior wall shall have joint raked 3/4 inch in preparation for backer rod and sealant.
   4. Control joints on faces of interior walls exposed to public view shall have joint raked 3/8 inch in preparation for sealant.
   5. Do not install vertical control joints at the ends of masonry lintels.
   6. Form control joints in concrete masonry using one of the following methods:
      a. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
      b. Install preformed control-joint gaskets designed to fit standard sash block.

c. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
d. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

F. Brick
1. Space control joints in concrete masonry at maximum 20 ft. on center maximum, at a maximum of 4 ft. from corners, at inside corners, and as indicated on drawings.

3.18 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.19 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.20 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.21 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.22 ENVIRONMENTAL REQUIREMENTS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
a. Protect sills, ledges, and projections from mortar droppings.

2. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
3. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

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

3.23 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:
1. Section 05 31 00 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.

1.02 DEFINITIONS

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

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data:
1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Shop primer.
9. Galvanized-steel primer.
10. Etching cleaner.
11. Galvanized repair paint.
12. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing qualified by testing, including the following:
1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator shop-painting applicators professional engineer testing agency.

B. Welding certificates.

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

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:
1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172), or a qualified fabricator who can submit evidence of successful fabrication of steel under similar job conditions over a period of not less than five (5) years.

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE Category CSE.

C. Shop-Painting Applicators: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 Endorsement P2 Endorsement P3 or to SSPC-QP 3.

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

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:
1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:
1. Connection designs have been completed and connections indicated on the Drawings.

2.02 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M, Grade 50.

B. Channels, Angles, M-Shapes , S-Shapes: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS AND CONNECTORS

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

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Hot-dip zinc coating Mechanically deposited zinc coating Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating mechanically deposited zinc coating, baked epoxy-coated finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex round head assemblies, consisting of steel structural bolts with splined ends;

ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain Mechanically deposited zinc coating.

E. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.04 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
1. Configuration: Straight
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain unless noted otherwise.

B. Headed Anchor Rods: ASTM F1554, Grade 36.
1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain unless noted otherwise.

C. Threaded Rods: ASTM A36/A36M.
1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened ASTM A36/A36M carbon steel.
3. Finish: Plain unless noted otherwise.

2.05 FORGED-STEEL STRUCTURAL HARDWARE

A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.06 PRIMER

A. Steel Primer:
1. SSPC-Paint 23, latex primer or approved equal.
2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying
3. with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26, MPI#80, or MPI#134.
1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A780/A780M.

2.07 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.08 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1, SSPC-SP 2 or SSPC-SP 3.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded-Steel Door Frames: Build up welded-steel door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated on Drawings.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.09 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened unless otherwise indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.
3. Galvanize all steel exposed to exterior elements unless noted otherwise on structural drawings.

2.11 SHOP PRIMING

A. Shop prime steel surfaces, except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.

4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 14 (WAB)/NACE WAB-8.
5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: When required by local jurisdiction, owner will engage a qualified testing agency to perform shop tests and inspections.
1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E165/E165M.
   b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   c. Ultrasonic Inspection: ASTM E164.
   d. Radiographic Inspection: ASTM E94/E94M.
4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
   a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
   b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
5. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.02 PREPARATION

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

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened unless otherwise indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.05 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

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

3.06 FIELD QUALITY CONTROL

A. Special Inspections: When required by local jurisdiction, owner will engage a special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: When required by local jurisdiction, owner will engage a qualified testing agency to perform tests and inspections.
   1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
   2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
      a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
         1) Liquid Penetrant Inspection: ASTM E165/E165M.
         2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not
         3) accepted.
         4) Ultrasonic Inspection: ASTM E164.
         5) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Acoustical roof deck.
   3. Composite floor deck.

B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.

1.02 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Roof deck.
   2. Acoustical roof deck.
   3. Composite floor deck.

B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.

D. Research Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Grade 33, G30 zinc coating.

2. Deck Profile: As indicated.
3. Cellular Deck Profile: As indicated
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: As indicated.
7. Side Laps: As indicated.

2.03 ACOUSTICAL ROOF DECK

A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M Grade 33, G30 zinc coating.
2. Deck Profile: As indicated.
3. Cellular Deck Profile: As indicated.
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: As indicated.
7. Side Laps: As indicated.
8. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
9. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
    a. Factory install sound-absorbing insulation into cells of cellular deck.

2.04 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Grade 33, G30 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.05 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet of same material and finish as deck; or of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet of same material and finish as deck, and of thickness and profile indicated recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet of same material and finish as deck. For drains, cut holes in the field.

K. Recessed Sump Pans: Single-piece steel sheet of same material and finish as deck, with 3-inch- wide flanges and level sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

L. Galvanizing Repair Paint: ASTM A780/A780M SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds or mechanical fasteners as indicated on Drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span, 18 inches, or as indicated on Drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld mechanically fasten flanges to top of deck. Space welds mechanical fasteners not more than 12 inches apart with at least one weld fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds mechanical fasteners as indicated on Drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span, 36 inches, or as indicated on Drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 REPAIR

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

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces top surface of prime-painted deck immediately after installation and apply repair paint.

2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: When required by local jurisdiction, owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

END OF SECTION 05 31 00

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.
   2. Roof joist framing.
   3. Related Requirements:
   4. Division 05 Sections for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
   5. Division 09 Sections for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.02 DELEGATED DESIGN

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 framing that are similar to those indicated for this Project in mater, design, and extent.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

B. Design Loads: As indicated.

C. Deflections Limits: Design framing systems to withstand design loads without deflections greater than the following:

D. Typical Exterior Non-Load Bearing Framing: Horizontal deflection of L/360 of the wall height.

E. Exterior Non-Load Bearing Framing at Brick: Horizontal deflection of L/360 of the wall height.

F. 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.

G. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

H. Design exterior non-load-bearing framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

B. Cold-formed steel framing materials.

C. Exterior non-load-bearing wall framing.

D. Vertical deflection clips.

E. Single deflection track.

F. Double deflection track.

G. Drift clips.

H. Soffit framing.

I. Post-installed anchors.

J. Power-actuated anchors.

K. Shop Drawings:

L. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

M. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

N. Drawings should be stamped, signed, and sealed by the qualified professional engineer responsible for their preparation.

O. Structural calculations stamped, signed, and sealed by the qualified professional engineer responsible for their preparation.

P. Delegated-Design Submittal: For cold-formed steel framing.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Steel sheet.

F. Expansion anchors.

G. Power-actuated anchors.

H. Mechanical fasteners.

I. Vertical deflection clips.

J. Horizontal drift deflection clips

K. Miscellaneous structural clips and accessories.

L. Research Reports:

M. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, and the Supreme Steel Framing System Association.

D. 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."

E. AISI Specifications and Standards: Comply with AISI's "North American Specifications for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing – General Provisions".

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100, ASTM C955, and AISI S200, and the following:
   1. [ASTM C955, Section 9] [AISI S240].Wall Studs: AISI S211.
   2. Headers: AISI S212.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.02 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with [ASTM C955] [AISI S200 and ASTM C955, Section 9] [AISI S240] for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60 or equivalent.

C. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60.

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips, Exterior: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch.

b. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

2. Inner Track: Of web depth indicated, and as follows:
   a. Minimum Base-Metal Thickness: 0.0428 inch.
   b. Flange Width: 3 inches unless noted otherwise.

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

2.04 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Joist hangers and end closures.
   10. Hole-reinforcing plates.
   11. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
   1. Uses: Securing cold-formed steel framing to structure.
   2. Type: Torque-controlled expansion anchor, torque-controlled adhesive anchor or adhesive anchor.
   3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 Class Fe/Zn 5, unless otherwise indicated.
   4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 or Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

D. Power-Actuated Anchors: Fastener systems of type suitable for application indicated, fabricated from corrosion-resistant materials, with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.08 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

A. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

B. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable 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 are not to exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners, install according to Shop Drawings, and comply 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 equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.04 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
   4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
   1. Install solid blocking indicated on Shop Drawings but not more than 96 inches apart.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

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

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

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

3.07 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items, including:
   1. Steel lintels.
   2. Ledge angles, shelf angles, channels, and plates not attached to structural framing.
   3. Elevator pit ladder, sill supports, and divider beams.
   4. Bollards.
   5. Window washing safety anchors.
   6. Weld plates.
   7. Door frames for overhead door openings, wall openings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 03 38 00 - Post-Tensioned Concrete: Placement of metal fabrications in post-tensioned concrete.

C. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 51 00 - Metal Stairs.

E. Section 05 52 13 - Pipe and Tube Railings.

F. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.

B. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application; 2017.

C. 29 CFR 1910.23 - Ladders current edition.

D. 29 CFR 1926.502 - Fall protection systems criteria and practices Current Edition.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

F. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

K. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

L. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.

M. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi

N. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

O. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.

P. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing 2021.

Q. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

R. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

S. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

T. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

U. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

V. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes 2019a.

W. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.

X. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings 2018, with Editorial Revision.

Y. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings 2018, with Editorial Revision.

Z. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021.

AA. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

BB. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

CC. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2015.

DD. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield

EE. ASTM F1941 - Standard Specification for Electrodeposited Coatings on Threaded Fasteners; 2010.

FF. Q. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

GG. R. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2009 (Reapproved 2015).

HH. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019, with Editorial Revision (2020).

II. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

JJ. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2014 (Amended 2015).

KK. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.

LL. AWS D1.2/D1.2M - Structural Welding Code - Aluminum 2014, with Errata.

MM. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel 2018.

NN. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.

OO. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

PP. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

QQ. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
      a. Include the following, as applicable:
         1) Design criteria.
         2) Engineering analysis depicting stresses and deflections.
         3) Member sizes and gauges.
         4) Details of connections.
         5) Support reactions.
         6) Bracing requirements.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

C. 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."

1.06 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. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Stainless Steel, General: ASTM A666, Type 304.

F. Stainless Steel Tubing: ASTM A554, Type 304, 16 gauge, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.

G. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

H. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

I. Slotted Channel Fittings: ASTM A1011/A1011M.

J. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

K. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

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

M. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

N. Eyebolts: ASTM A 489.

O. Machine Screws: ASME B18.6.3.

P. Lag Screws: ASME B18.2.1.

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

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

S. Lock Washers: Helical, spring type, ASME B18.21.1.

T. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

U. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

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

W. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

X. Shop and Touch-Up Primer - Interior Exposure: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

Y. Zinc-Rich Primer - Exterior Exposure: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      a. Products: Cementitious Galvanized-Metal Primer: MPI #26. (VOC Content: E Range of E1.)
         1) Carboline, Carbozinc 859.
         2) Tnemec Company, Inc.; Tneme-Zinc 90-97.

Z. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

AA. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.02 MATERIALS - ALUMINUM

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

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

F. Aluminum-Alloy Die Castings: ASTM B85/B85M.

G. Bolts, Nuts, and Washers: Stainless steel.

H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. 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.

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

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

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

1. Use materials and methods that minimize distortion and develop strength and corrosionresistance 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.

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

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

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

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

M. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.

1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
3. Space rungs 7 inches from wall surface.

4. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
5. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
1. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; duplex galvanized and primed finish.
a. Plastic Bollard Covers: Low density polyethylene thermoplastic molded sleeves slide over steel bollards.
1) Manufacturer: Ideal Shield, Basis of Design.
2) Thickness: ¼-inch.
3) Top: 2" high domed crown.
4) Size: To fit height and diameter of steel bollard.
5) Installation tape: allows for secure installation within minutes and no need for messy adhesives.
6) Color: As selected by architect.

C. Bollards: Schedule 40 steel pipe, concrete filled, crowned cap, (unless detailed otherwise); galvanized finish.
1. Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.
2. Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.
3. Where sleeves are noted, fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
4. Size: 4 inch outside diameter unless noted otherwise on drawings.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; duplex galvanized and primed finish.

E. Lintels: As detailed; duplex galvanized and primed finish.

F. Stainless steel safety anchors and davits for window washing equipment.
1. Detailed structural design and layout is by the installing contractor's professional engineer.
2. Comply with the following:
a. All applicable state, local and regional codes.
b. OSHA REGULATION 29 CFR 1910.23 (E) (1) ; (E) (3) (IV).
c. OSHA REGULATION 29 CFR 1926.502 (B) (1) - (B) (14).

G. Weld Plates: 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.

H. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

I. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.05 ACCESSORY PRODUCTS

A. High-strength (6,000 to 10,000 psi), Non-Shrink, Non-Metallic Grout: Provide premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for exterior applications.

B. Corrosion Protection: Coat concealed surfaces of aluminum and copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
1. Aluminum surfaces in contact with lime-mortar, concrete, or other masonry materials, shall be protected with alkali-resistant coatings, such as heavy-bodied bituminous paint.

2. The bituminous paint used shall conform to United States Military Specification MIL-P-6883.

2.06 FINISHES, INTERIOR EXPOSURE

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Shop Priming: Apply one coat of Universal Shop Primer to uncoated surfaces of metal fabrications, except where indicated to receive sprayed-on fireproofing.

2.07 FINISHES, EXTERIOR EXPOSURE

A. Duplex System: Hot-dip galvanize and apply shop primer compatible with both galvanizing and the top coats to be field applied by Division 9 Section. Comply with all recommendations of manufacturer's product data for the compatible zinc-rich shop primer, including preparation.
   1. Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
      a. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Galvanizing: Hot-dip galvanize items exposed to the exterior 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.
   3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   4. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
   5. For newly galvanized surfaces, a water-based emulsifier can be used to remove contaminants.
   6. After cleaning, thoroughly rinse the surface clean, with hot water and allow complete drying before profiling.
   7. Profile Galvanized surfaces, free of protrusions and slightly roughened to provide an anchor profile to allow a good mechanical bond. Take care to remove as little zinc as possible.
   8. Apply compatible zinc-rich shop primer to galvanized surfaces of metal fabrications.

2.08 FINISHES - ALUMINUM

A. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors.

2.09 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. 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.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. At concrete floor structure, slotted channel framing shall be attached without damage to reinforcing.

F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

G. Obtain approval prior to site cutting or making adjustments not scheduled.

H. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

I. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized with SSPC-PA 1 for touching up shop-painted surfaces.

J. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with metal treads.

C. Structural steel stair framing and supports.

D. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 50 00 - Metal Fabrications.

E. Section 05 52 13 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

F. Section 09 91 23 - Interior Painting: Paint finish.

G. Section 10 14 00 - Signage: Photoluminescent markings.

1.03 REFERENCE STANDARDS

A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling 2021.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

J. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates 2015 (Reapproved 2021).

K. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2021).

N. NAAMM AMP 510 - Metal Stairs Manual 1992.

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.

P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

Q. SSPC-SP 2 - Hand Tool Cleaning 2018.

R. UL 1994 - Luminous Egress Path Marking Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 01 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.
   3. 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.

C. Welders' Certificates.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   4. Photoluminescent Stair Accessories: Comply with applicable building code.
   5. Dimensions: As indicated on drawings.
   6. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   7. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   8. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
5. Concrete Reinforcement: Welded wire mesh.
6. Concrete Finish: Steel troweled.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
2. Nosing Depth: Not more than 1-1/2 inch overhang.
3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: As required by design;10 inches minimum.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.
1. Close exposed ends of railing members with prefabricated end fittings.
2. Provide wall returns at ends of wall-mounted handrails.

H. Finish: Galvanized after fabrication, except sheet components to be galvanized before fabrication.
1. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 METAL STAIRS WITH METAL TREADS

A. Location: Stairs 4 and 5.

B. Jointing and Finish Quality Level: ***Commercial,*** as defined above.

C. Risers: Closed.

D. Treads: Checkered steel plate.
1. Tread Thickness: 1/8 inch, minimum.
2. Photoluminescent Nosing: Factory fabricated nosing with embedded photoluminescent strip; field applied to front edge of tread at stair 5.
3. Factory Fabricated Tread and Nosing: Manufacturer's standard, with integral tread, nosing, abrasive filler and factory applied finishes at stair 4.
4. Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.

E. Risers: Steel sheet.
1. Riser Thickness: As required by design; 14 gage, 0.075 inch minimum.
2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

F. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches minimum unless noted otherwise.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

G. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

H. Railings: Steel pipe railings.

I. Photoluminescent Handrail Strips: Factory fabricated, field applied strips at stair 5.

J. Finish: Shop- or factory-prime painted.

2.04 HANDRAILS AND GUARDS

A. Wall-and Stringer Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch.
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 4 inches on center.
      d. Jointing: Welded and ground smooth and flush.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Mounting: Welded to top surface of stringer.

C. Photoluminescent Handrail Strips: Factory fabricated, field applied strips in stairs 5**.**

2.05 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

E. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

F. Checkered Plate: ASTM A786/A786M, rolled steel floor plate; manufacturer's standard pattern.

G. Concrete Fill: See Section 03 30 00.

2.06 ACCESSORIES

A. Photoluminescent Nosing: Factory fabricated aluminum extrusion with replaceable embedded photoluminescent and slip-resistant strip, complies with UL 1994, applied in stair 5.
   1. Finish: Manufacturer's standard clear anodized.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Attachment: Provide manufacturer approved field applied adhesive and mechanical fasteners.
   4. Manufacturers:
      a. Safe-T-Nose, LLC: www.safetnose.com/#sle.

B. Photoluminescent Pathmarking Strips: Manufacturer's standard photolumiescent extruded plastic solid strips and clear anodized aluminum extrusion with embedded photoluminescent strip, complies with UL 1994.
   1. Attachment: Provide manufacturer approved factory applied adhesive.
   2. Location: Stair 5.
   3. Manufacturers:
      a. Safe-T-Nose, LLC: www.safetnose.com/#sle.
      b. Ecoglo Inc..
      c. Substitutions: See Section 01 25 13-Product Substitution Procedures..

C. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M) Type 1and galvanized to ASTM A153/A153M where connecting galvanized components.

D. Steel Bolts, Nuts, and Washers: , galvanized to ASTM A153/A153M where connecting galvanized components.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 PHOTOLUMINESCENT EGRESS PATH MARKINGS

A. Provide in stair tower 5 as follows.

1. Solid continuous stripe on the leading edge of each step.
2. Solid continuous stripe on each landing at the leading edge of each top step.
3. Solid continuous stripe on the top surface of each handrail for the entire length of the handrail, including handrail extensions and post caps.
4. Solid perimeter demarcation stripe identifying the edge of each landing located on the wall or landing floor or combination of both, with continuous vertical stripes
5. Obstacles located below 6'-6" and projecting more than 4" from the wall to be identified with maximum 2" alternating bands cut at 45 degree angles of luminous material and black.
6. Exit discharge luminous door markings including minimum 4" high emergency exit symbol maximum 18" above the floor, minimum 16 sq. in. of door hardware markings on and/or around door exit hardware, and door frame markings with 1"-2" wide solid continuous stripe on the top and both sides of the frame.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Free-standing railings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 03 38 16-Unbonded Post-Tensioned Concrete: Placement of anchors in concrete.

C. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

D. Section 05 51 00 - Metal Stairs: Handrails other than those specified in this section.

E. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2013.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.

H. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2007.

I. AWS C3.4M/C3.4 - Specification for Torch Brazing 2007.

J. AWS C3.5M/C3.5 - Specification for Induction Brazing 2016, with Amendment (2017).

K. AWS C3.9M/C3.9 - Specification for Resistance Brazing 2020.

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
      b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
   3. Brass/Bronze Brazed Joints:
      a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
      b. Perform induction brazing in accordance with AWS C3.5M/C 3.5.
      c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Interior Components: Continuously seal joined pieces by continuous welds.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05 73 16
CABLE GUARDRAIL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the parking structure perimeter cable guardrail system to furnish and install, including all accessories necessary for the proper installation of the Cable Guardrail System.

1.02 SUBMITTALS

A. Design Data:
   1. Submit complete, exact and specific design data for exact products specified.
   2. The cable supplier shall submit, as a part of the shop drawing submittal, complete stressing details and provisions for ensuring proper anchor set.

B. Product Data:
   1. Submit manufacturer's specifications to evidence compliance with the Contract Documents.
   2. Submit manufacturer's installation instructions.
   3. Manufacturer's Product Data shall be clearly and specifically marked to indicate the specific models or t hypes intended for submittals and desired approval.

C. Shop Drawings:
   1. Submit complete fabrication details and erection drawings.
   2. Show complete details of anchorage components, stressing procedures including elongation calculations.
   3. The A/E review of the shop drawings shall not relieve the Contractor of their responsibility for performing the work in accordance with the Contract Documents.

D. Samples:
   1. Submit representative samples of anchorages, wedges, etc.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
   2. Manufacturer shall submit evidence of having not less than 10 years successful production of the product.

B. Subcontractor Qualifications:
   1. Subcontractor shall submit evidence of skill and not less than 5 years specialized experience with this product.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products in exact accordance with the manufacturer's latest published requirements and specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Prestressing Steel: Prestressing steel shall be seven-wire stress-relieved strand for prestressed concrete manufactured in accordance with ASTM A 416 and free from corrosion, and shall have a minimum tensile strength of 270 ksi.
   1. Nominal Diameter: ½"
   2. Area: 0.153 square inches
   3. Modulus of Elasticity: 29,000 ksi
   4. Minimum Ultimate Strength: 41.3 kips

B. Anchorages: Anchorages and bearing plates shall meet the minimum requirements set forth in ACI Standard Building Cold Requirements for Reinforced Concrete (ACI-318), or Prestressed Concrete Institute " PCI Standard Building for Prestressed Concrete".
   1. Bearing Plate Materials: 42,000 psi minimum yield unless noted otherwise
   2. Anchorhead: C1050 Special Bar Quality. HR Normalized.
   3. Wedge: AISI C11 L 17 or equal
   4. Cast Anchorage: ASTM A 563 Gr > 80-60-03

C. Strand Coating: Coating shall be per ASTM A 475 as provided by VSL Corporation or equal.

D. Steel Pipe Sleeves: PVC pipe shall conform to the requirements of ASTM D 1785.

2.02 EQUIPMENT PERFORMANCE REQUIREMENTS

A. Fabricating and Placing: All equipment used for fabricating, handling, and placing tendons shall be such that it does not damage or deteriorate the prestressing steel or the anchorage.

B. Jacking Equipment
   1. All hydraulic jacks used for stressing operations shall be equipped with accurate reading calibrated hydraulic pressure gages to permit the stress in the prestressing steel to be computed at any time.
   2. A calibration chart shall accompany each chart.
   3. In inconsistencies between the measured elongation and the jack gage reading occur, the jack gage pump unit shall be recalibrated.
   4. An agreement with 10 percent plus or minus shall be considered satisfactory.

2.03 SOURCE QUALITY CONTROL

A. Tests
   1. Mill Tests: Prestressing Steel:
      a. Submit certified mill reports on the prestressing steel used.

B. Individual Tests (Anchorage): Submit reports on three individual tests performed in accordance with the following criteria for review by the A/E.
   1. Static Tests:
      a. Stressing anchorages shall develop at least 95 percent of the minimum specified ultimate strength of the prestressing steel without exceeding anticipated set.
      b. The total elongation under ultimate load of the tendon shall not be less than 2 percent measured in a minimum gage length of 10 feet.
      c. The tendon assembly shall be tested in such a manner as to allow accurate determination of the yield strength, ultimate strength, and percent elongation of the complete tendon to ensure compliance with this specification.
      d. The specimen used for the static test need not be one that has been subjected to dynamic loading.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine and verify that receiving substrate surfaces and steel assemblies of the structure have no defects or errors which would result in poor or potentially defective application or cause latent defects in workmanship.

B. Report any unsatisfactory conditions to the A/E.

C. Starting installation shall imply acceptance of the surfaces.

3.02 PREPARATION

A. Prepare substrate surfaces to insure proper and adequate installation, in exact accordance with the Contract Documents and approved Shop Drawings, or manufacturer's requirements.

B. Field measure and verify dimensions as required.

C. Protect adjacent areas or surfaces from damage as a result of the Work of this Section.

3.03 INSTALLATION

A. Install in exact accordance with manufacturer's latest published requirements, instructions, specifications, details and approved shop drawings.

B. Interface with Other Products: Coordinate and cooperate with all supporting, adjacent, contiguous or otherwise related materials trades.

C. Installation/Erection Tolerances (Stressing): Stress cables so that, after final seating of wedges, the remaining force per cable in not less than 2,100 pounds and not more than 2,500 pounds, unless noted otherwise on the Contract Documents.

D. Install all pipe sleeves in proper alignment to prevent damage to the tendon sheathing when stressing.

3.04 CLEANING

A. Immediately remove all spots, smears, stains, residues, adhesive, etc., from the Work of this Section and/or upon adjacent areas or surfaces which result from the Work of this Section.

B. Upon the completion of the Work of this Section, dispose of, away from the Site, all debris, trash, containers, residue, remnants and scraps which result from the Work of this Section.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors and fenestration.

B. Roofing nailers.

C. Fire retardant treated wood materials.

D. Communications and electrical room mounting boards.

E. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

B. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

D. PS 2 - Performance Standard for Wood Structural Panels 2018.

E. PS 20 - American Softwood Lumber Standard 2020.

F. SPIB (GR) - Grading Rules 2014.

1.03 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Research/ Evaluation Reports: For the following, show compliance with the building codes in effect for the Project:

1. Wood preservative treated wood.
2. Fire retardant treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.05 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

C. Provide five year manufacturer warranty for Work as completed as part of this Section.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

B. Lumber fabricated from old growth timber is not permitted.

C. Provide composite wood products that do not contain added urea formaldehyde.

D. Lumber: DOC PS 20 and applicable rules of grading agencies indicated, if no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

E. Engineered Wood Products: Provide 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: Provide engineered wood products with allowable design stresses, as published by manufacturer, that 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. Urea-formaldehyde content to be less than 100 ppm.

2.02 FACTORY WOOD TREATMENT

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

C. Fire Retardant Treatment:
   1. General: Comply with performance requirements of American Wood Protection Association, AWPA U1-10.
   2. 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.

a. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
   1) Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   2) Treat all exterior rough carpentry items.
   3) Do not use treated wood in direct contact with the ground.
   4) Products and Applications:
      (a) Dricon FRX at: Exterior Applications:
      (b) Interior areas with a relative humidity over 50%.
      (c) Concealed blocking within exterior walls.
      (d) Other areas specifically noted on drawings.
      (e) Note: Do “Not” use Dricon FRX where enclosed in roofing assemblies!

b. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
   1) Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   2) All interior rough carpentry items are to be fire retardant treated.
   3) Treat rough carpentry items as scheduled.
   4) Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
   5) Do not use treated wood in applications exposed to weather or where the wood may become wet.
   6) Products and Applications:
      (a) Dricon FRT at: Interior Applications and at the following other applications:
      (b) Concealed blocking within parapets.
      (c) Roof construction, rooftop equipment bases and support curbs.

2.03 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for exterior items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing noarsenic 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.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members incontact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.04 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine; No. 2 grade; SPIB.
2. Eastern softwoods; No. 2 Common grade; NeLMA.
3. Northern species; No. 2 Common grade; NLGA.
4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

2.05 CONSTRUCTION PANELS

A. Plywood Blocking and Nailers: Plywood, PS 1, Grade C-D, Exposure I.
1. Thickness as required for span.

B. Communications and Data Mounting Boards: (When applied to room-side of wall only)
1. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 5 or less and smoke-developed index of 25 or less per ASTM E 84.
a. Thickness 3/4 inch.
b. Comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi modulus of elasticity, 300,000 psi internal bond, 80 psi and screw-holding capacity on face and edge, 250 and 225 lbf respectively.
c. Product: Subject to compliance with requirements, provide 'Duraflake FR' by Weyerhaeuser.
d. Fire-retardant treatment is not required for mounting boards that are mounted behind drywall within the stud cavity.

2.06 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Provide fasteners approved for use with fire rated material.
3. Screws for fastening to metal framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended for material being fastened.
4. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Anchors: Toggle bolt type for anchorage to hollow masonry.
1. Power-Driven Fasteners: NES NER-272.

2. Bolts: Steel bolts complying with ASTM A 325; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.
4. Size and Location:
   a. Communication and data closets: All walls from 1 foot above finish floor to 8 feet above finish floor (install on room-side of wall)
   b. Electrical closets: as required for electrical panel installation (install behind finish face of gypsum wallboard within stud cavity).

3.04 CLEANING

A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

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SECTION 07 05 53
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code 2015.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.05 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil.

C. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 91 23 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install applied markings in accordance with Section 09 91 23.

C. Install neatly, with horizontal edges level.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

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SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:
   1. Self-adhered HDPE sheet membrane.
   2. Self-adhered HDPE sheet membrane, post applied.
   3. The Work of this Section includes, but is not limited to, pre-applied sheet membrane waterproofing that forms an integral bond to poured concrete for the following applications:
      a. Vertical Applications: Membrane applied against soil retention system prior to placement of concrete foundation walls;
      b. Horizontal Applications: Membrane applied on prepared subbase prior to placement of concrete slabs.
         1) Use for the following waterproofing conditions:
            (a) Below elevator pit slabs.
            (b) Other locations where indicated on Drawings

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 14 00 - Fluid Applied Waterproofing: Vertical applications after placement of concrete foundation walls.

C. Section 07 21 00 - Thermal Insulation: Perimeter insulation at below grade walls and underslab.

1.03 REFERENCE STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course 2012.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2006a (Reapproved 2013).

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting 2012.

D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds 1998 (Reapproved 2010).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test) 2008.

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2013.

G. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes 1993 (Reapproved 2014).

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2014.

I. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover 2008a (Reapproved 2013).

J. NRCA (WM) - The NRCA Waterproofing Manual 2005.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
   1. Indicate details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other temination conditions.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Installer Certificates: Signed by manufacturer certyfying that insallers comply with requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with ten years experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.
   1. Installer shall be approved by the manufacturer.

1.06 MOCK-UP

A. See Section 01 43 39-Mock-ups for additional requirements.

B. Construct mock-up consisting of 100 sq ft of vertical waterproofed panel; to represent finished work including internal and external corners.

C. Locate where directed.

D. Mock-up may remain as part of this Work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer’s instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

1.08 FIELD CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.09 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MEMBRANE MATERIALS

A. Self-Adhered HDPE Sheet Membrane: Recommended by manufacturer for placement below concrete slabs and on outside face of below grade walls before placement of concrete.
   1. Sheet Thickness: 46 mil (0.046 inch), minimum.
   2. Low Temperature Flexibility: Unaffected when tested in accordance with ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
   3. Hydrostatic Pressure Resistance: Resists pressure of 231 ft head of water, when tested in accordance with ASTM D5385/D5385M.
   4. Elongation at Break: 500 percent, minimum, measured in accordance with ASTM D412.
   5. Tensile Strength, Film: 3,500 psi, minimum, measured in accordance with ASTM D412.
   6. Lap Peel Adhesion: 5 pounds per inch, minimum, when tested according to ASTM D1876.
   7. Water Vapor Permeance: 0.01 perm, maximum, measured in accordance with ASTM E96/E96M.

8. Lateral Water Migration Resistance: Resists pressure of 231 ft head of water, when tested in accordance with ASTM D5385/D5385M.
9. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.

B. Basis of Design:
1. AVM Industries, Inc; Aussie Skin 550: www.avmindustries.com/#sle.
2. GCP Applied Technologies; Preprufe 300R Plus: www.gcpat.com/#sle.

C. Self-Adhered HDPE Sheet Membrane, Post-Applied: Recommended by manufacturer for placement on outside face of below grade concrete and concrete masonry unit (CMU) backfilled walls and select horizontal applications.
1. Sheet Thickness: 30 mil, 0.030 inch, minimum, and with 20 mil, 0.020 inch thick adhesive.
2. Low Temperature Flexibility: Unaffected when tested in accordance with ASTM D1970/D1970M at minus 25 degrees F, 180 degree bend on 1 inch mandrel.
3. Tensile Strength, Film: 1,000 psi, minimum, measured in accordance with ASTM D882.
4. Lap Adhesion: 6.8 lb per inch, minimum, when tested in accordance with ASTM D1876.
5. Water Vapor Permeance: Less than 0.1 perm, measured in accordance with ASTM E96/E96M.
6. Peel Strength: 16 lb per inch, minimum, when tested in accordance with ASTM D903.
7. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
8. Manufacturers:
   a. GCP Applied Technologies; Preprufe 800PA: www.gcpat.com/#sle.
   b. Tremco Commercial Sealants & Waterproofing; TREMproof 560: www.tremcosealants.com/#sle.
   c. Carlisle Coatings and Waterproofing; MiraDRI 860/861: www.carlisleccw.com.

D. Other Substitutions: Not permitted.

2.02 ACCESSORIES

A. Seaming Materials: As recommended by membrane manufacturer.

B. Membrane Sealant: As recommended by membrane manufacturer..

C. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

D. Protection Board: Rigid insulation as specified in Section 07 21 00.

E. Flexible Flashings: Type recommended by membrane manufacturer.

F. Waterstop: AdcorTM ES hydrophilic non-bentonite waterstop by Grace Construction Products for non-moving concrete construction joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
1. It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 inch. Grout around all penetrations such as utility conduits, etc. for stability.

a. Horizontal Surfaces - The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

b. Vertical Surfaces - Use insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 inch out of alignment.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer.

D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

E. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

F. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

G. Seal membrane and flashings to adjoining surfaces.

1. Install termination bar along edges.

3.04 WATERSTOP INSTALLATION

A. Strictly comply with installation instructions in manufacturer’s published literature.

3.05 INSTALLATION - PROTECTION BOARD

A. Place protection board directly against earth retention system; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

B. Adhere protection board to substrate with compatible adhesive.

3.06 FIELD QUALITY CONTROL

A. Contractor will provide testing services in accordance with Section 01 45 29-Testing Laboratory Services

3.07 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:
   1. Hot-applied rubberized asphalt waterproofing.

B. Accessories:
   1. Prefabricated drainage composite.
   2. Waterstop.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

B. Section 03 38 16 - Unbonded Post-Tensioned Concrete: Concrete substrate.

C. Section 07 13 00 - Sheet Waterproofing: Waterproofing used at foundations poured against earth retention system and backfilled foundation walls.

D. Section 07 21 00 - Thermal Insulation: Insulation used for protective cover.

E. Division 22 - Roof drain and plumbing vent flashing flanges.

F. Division 33 - Subdrainage.

1.03 REFERENCE STANDARDS

A. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes 1993 (Reapproved 2014).

B. ASTM D7877 - Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes 2014.

C. ASTM D8231 - Standard Practice for the Use of a Low Voltage Electronic Scanning System for Detecting and Locating Breaches in Roofing and Waterproofing Membranes 2019.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2014.

E. NRCA (WM) - The NRCA Waterproofing Manual 2005.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data for membrane and flexible flashings.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

F. Testing Firm's qualification statement.

G. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's documentation that installation complies with warranty conditions for the field-applied waterproofing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

1. Fluid applied waterproofing material shall be two part synthetic rubber based system free of isocyanates and bitumen.
2. For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Testing Firm Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

D. Pre-Installation Conference:
1. A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
2. Agenda for meeting shall include review of special details and flashing.

1.06 MOCK-UPS

A. See Section 01 43 39-Mock-ups for additional requirements.

B. Construct mock-up consisting of 100 sq ft of horizontal waterproofed panel; to represent finished work including internal and external corners, drainage panel, base flashings, control joints, expansion joints, counterflashings, and protective cover.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
1. Do not double-stack pallets of waterproofing material on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
2. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
3. Protect waterproofing materials from freezing. In cool temperatures, store the material for several hours at room temperature to facilitate mixing and application.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 FIELD CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive membrane waterproofing.

1.09 WARRANTY

A. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Hot-Applied Rubberized Asphalt Waterproofing:

1. Location: waterproofing membrane at split slabs, utility vault caps, and where indicated on drawings..
2. Cover with Insulation, protection board, and/or drainage composite as indicated on drawings.

2.02 FLUID APPLIED WATERPROOFING MATERIALS

A. Hot-Applied Rubberized Asphalt Waterproofing: Elasticized rubberized asphaltic compound, hot-applied and quick setting.
1. Capable of resisting maximum water head of 231 feet and preventing moisture migration to interior, tested in accordance with ASTM D5385/D5385M.
2. Suitable for installation over concretesubstrates.
3. Ultimate Elongation: 1000 percent, minimum, measured in accordance with ASTM D412.
4. Water Vapor Permeance: 0.1 perm, maximum, measured in accordance with ASTM E96/E96M.
5. Finished Coating Thickness: 125 mil, 0.125 inch, minimum.
6. Products:
   a. American Hydrotech, Inc; Monolithic Membrane 6125: www.hydrotechusa.com/#sle.
   b. Carlisle Coatings & Waterproofing, Inc; CCW 500: www.carlisleccw.com/#sle.
   c. Henry Company; 790-11: www.henry.com/#sle.
   d. W.R. Meadows, Inc; HRM 714: www.wrmeadows.com/#sle.

2.03 ACCESSORIES

A. Surface Conditioner: Type, compatible with membrane compound; as recommended by membrane manufacturer.

B. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.

C. Reinforcing Fabric for Between Liquid Applied Membranes (LAM): Polyester fabric, unsaturated spun bond and nonwoven, used as reinforcement between LAM waterproofing systems.
1. Thickness: 9.5 mil, 0.0095 inch, minimum.
2. Products: As recommended by membrane manufacturer.

D. Protection Board: Provide type capable of preventing damage to waterproofing due to backfilling and construction traffic.

E. Drainage Composite: as recommended by the manufacturer for each condition.

F. Waterstop: Adcor ES hydrophilic non-bentonite waterstop by Grace Construction Products for non-moving concrete construction joints.
1. Physical Properties:
   a. Size: 1.0 in. x ½ in. x 16 ft. rolls.
   b. Hydrostatic Head Resistance: 231 feet.
   c. Wet - Dry Cycling [25 Cycles @ 231 feet]: No effect.
   d. Adhesion to Concrete using Adcor ES Adhesive: Excellent.

G. Miscellaneous Materials: Tape and other accessories specified or acceptable to manufacturer of fluid applied waterproofing membrane.

2.04 INTEGRATED LEAK DETECTION SYSTEM COMPONENTS

A. An on demand system is the minimum required.

B. Conductor cable, conductive mesh/grid, measurement grid moisture detection tape, sensor cable/grid, and/or conductive glass felt etc. as necessary to affect a complete integrated leak detection system as required per manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

E. Condition of Concrete Surfaces:

1. 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.
2. 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.
3. Concrete shall be cured at least 14 days and shall be sloped for proper drainage.
4. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the un-repaired areas.
5. Two-stage drains shall have a minimum three inch flange and be installed with the flange flush and level with the concrete surface.
6. Surfaces at cold joints shall be on the same plane.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

F. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

G. Prepare building expansion joints at locations as indicated on drawings.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

C. Apply extra thickness of waterproofing material at corners, intersections, and angles.

D. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

E. Extend waterproofing material and flexible flashing into drain clamp flange, apply adequate coating of liquid membrane to ensure clamp ring seal, and coordinate with drain installation requirements; see Division 22.

F. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL

A. Apply prefabricated drainage composite in accordance with manufacturer's recommendations.

B. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward, and scribe and cut boards around projections, penetrations, and interruptions.

C. Where prefabricated drainage composite is used in conjunction with perimeter foundation insulation as specified in Section 07 21 00, adhere rigid board insulation over prefabricated drainage composite with manufacturer's recommended adhesive, compatible with adjacent products.

1. Mechanically fastening rigid board insulation is not permitted.

3.05 INSTALLATION - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

A. Apply 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 Waterproofing Membrane, including over flashings, at a rate of 500 sq. ft. per gallon. Avoid puddles. Allow primer to dry for one hour minimum, eight hours maximum. Membrane will not properly adhere to wet primer.

B. Heat 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.).

C. Apply heated 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.

D. Apply 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 heat the fabric splices together with membrane.

E. Apply a second coat of 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 system shall be 215 mils.

F. Apply Protection Board HS into the last course of Hot Applied Membrane and splice the protection board seams together.

G. During the course of the work and upon substantial completion, the Manufacturer shall inspect the work to verify conformance of the work with the Manufacturer’s recommendations and warranty requirements.

H. Protection Course
1. Install Protection Board immediately after Electronic Vector Mapping on horizontal surfaces. If testing is delayed, install a temporary covering to protect the membrane from damage by other trades.

3.06 FIELD QUALITY CONTROL

A. Owner will provide testing services and Contractor to provide temporary construction and materials for testing.

B. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

C. Electronic Leak Detection (ELD) Testing: Test roofing areas for leaks using ELD method that locates discontinuities in fluid-applied waterproofing in accordance with ASTM D7877 or ASTM D8231.
1. Testing agency to submit Daily Field Report (DFR) in accordance with ASTM D8231 indicating daily details of work performed.
2. Testing agency to submit training certification to ensure that technician performing ELD testing is currently certified in accordance with relevant training program.
3. Products:
   a. Detec Systems; Electronic Leak Detection Quality Control Testing - IntegriScan: www.detecsystems.com/#sle.
   b. IR Analyzers / Vector Mapping; Electric Field Vector Mapping Membrane Integrity Testing: www.iranalyzers.com/#sle.

D. Flood Testing
1. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.
2. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.
3. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.
4. When area is proven watertight, drain water and remove dam.

3.07 CLEANING AND PROTECTION

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

3.08 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foam Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, and exterior wall behind rain screen wall finish.

B. Rock-wool-fiber board insulation.

C. Spray-applied insulations:
   1. Polyurethane foam.
   2. Incidental spray applied thermal treatment.
   3. Spray applied acoustical/thermal insulation.

D. Fasteners, adhesive, and other accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Masonry walls enclosing insulation.

B. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

C. Section 07 84 00 - Firestopping: Fire safing insulation.

D. Section 07 25 11 - Weather Barriers - Fire Retardant Fluid Applied.

E. Section 07 53 00 - Elastomeric Membrane Roofing: Board insulation over low slope roof deck specified in this section.

F. Section 08 43 13 Aluminum Framed Storefronts: Low expanding foam insulation in shim spaces around openings specified in this section.

G. Section 08 51 13 Aluminum Windows: Low expanding foam insulation in shim spaces around openings specified in this section.

H. Section 09 51 00 - Acoustical Ceilings: Insulation above ceiling systems.

I. Division 22 and 23 Sections: Duct insulation, equipment insulation and pipe insulation.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2010.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2021.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2014.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components 2012.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

1.06 FIELD CONDITIONS

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene board.

C. Insulation Inside Masonry Cavity Walls: Polyisocyanurate board.

D. Insulation Inside Rain Screen Walls: Polyisocyanurate board.

E. Insulation Concealed in furring spaces: Polyisocyanurate board.

F. Spray-applied polyurethane foam insulation: Applications where indicated on Drawings.

G. Insulation at top of metal framed wall and fluted metal deck: Rock-wool-fiber board insulation.

H. Where detailed on drawings: rock-wool-fiber board insulation and incidental spray applied acoustical/thermal insulation.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: See drawings for thickness.
   5. Board Edges: Square.
   6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
   7. Thermal Conductivity (k-factor or u-value per inch) at 25 degrees F: 0.20.
   8. Compressive Resistance: 25 psi.
   9. Products:
      a. Owens Corning Corp: www.owenscorning.com.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.

B. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:

a. Type I: Faced with aluminum foil on both major surfaces of core foam.
1) Compressive Strength: 25 psi, minimum.

2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Faces: 1.0 mil thick reflective aluminum facers on both sides.
4. Surface Burning Characteristics (at a maximum thickness of 4.25 inches.) Comply with current IBC and NFPA requirements for foam plastic insulation for use in non-combustible construction, meeting the following criteria:
   a. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   c. The panels are classified as a (Class 1)(Class A) Interior Finish Material.
5. Density: Nominal 2 pcf.
6. Water Vapor Transmission (ASTM E96): less than 0.1 perm.
7. Water Absorption by Volume (ASTM C209): less than 1 percent.
8. Board Size: 48 inch by 96 inch.
9. Thickness: See drawings for thicknesses.
10. Thermal Resistance: Minimum R-value per inch of 6.3.
11. Board Edges: Shiplap on long edges.
12. Basis of Design: Dupont Thermax Sheathing Foam Insulation.
    a. ICC-ES 1659.
    b. UL Classified, see Classification Certificate 1256. Calif. Std. Reg. # CA T383.
    c. Other acceptable manufacturers: must comply with NFPA 285.
       1) Atlas Wall CI Board, division of Atlas Roofing Corporation; EnergyShield PRO: www.atlasroofing.com.
       2) Hunter Panels, LLC; Xci Class A Foil: www.hunterxci.com.
       3) NO SUBSTITUTIONS: All of the product options specified for use as wall system components have been carefully selected for compatibility with each other for compliance with NFPA-285, as documented by Third Party Selection Charts. For this reason, substitution requests are not permitted here.
13. Accessories for Polyisocyanurate Board Installation:
    a. Penetration and Gap Filler.
       1) The Dow Chemical Company; GREAT STUFF PRO™
          (a) Use for joints between boards and at penetrations where gap size is between 1/4-inch to 2-inches.
    b. Exterior Insulation Joint Treatment.
       1) The Dow Chemical Company; LIQUIDARMOR™ CM spray flashing and sealant.
          (a) Use for gaps less than 1/4-inch.
       2) The Dow Chemical Company; LIQUIDARMOR™ LT flexible single component silicone flashing.
          (a) Use for gaps greater than 1/4-inch
    c. Always use both Penetration and Gap Filler prior to sealing joint with Exterior Insulation Joint Treatment (as this is best practice installation.)

2.03 FIBERBOARD INSULATION MATERIALS

A. Mineral Fiberboard Insulation: Rigid mineral fiber, in accordance with ASTM C612.
1. Facing: Black non-woven mat.
2. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
3. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
4. Board Size: 48 by 48 inch.
5. Board Thickness: 1 inch.
6. Board Edges: Square.

7. Thermal Conductivity (k-factor): BTU inch/hr sq ft degrees F of 0.26 per inch at 75 degrees F when tested in accordance with ASTM C518.
8. Maximum Density: 8 pounds per cubic foot, nominal.
9. Thermal Resistance: R of 4.2 per inch.
10. Products:
    a. Rockwool – Cavityrock.
    b. Owens Corning, Thermafiber – Rain Barrier HC.

2.04 SPRAY-APPLIED POLYURETHANE FOAM INSULATION

A. Basis of Design:
1. Manufacturer: Icynene Inc.
2. Product: ProSeal LE, commercial.
3. Description: The polyurethane foam is produced in the field by combining polymeric isocyanurate (A) component and a resin (B) component.
4. Comply with ICC–ES ESR 3500.
    a. Appropriate for Construction Type 1.
    b. Tested for NFPA 285 compliance for project wall system designs.
    c. Class-I spray foam per ASTM E 84
        1) Flame spread: 25 maximum.
        2) Smoke developed: 450 maximum.
5. Tested for NFPA 285 compliance for project wall system designs.
6. Closed-cell performance requirements:
    a. Qualifies as Class II vapor retarder at 1.5-inch thickness.
    b. Core Density: 2.4 lb/ft³.
    c. Aged R-value per inch: 7.1

B. Acceptable manufacturers if compliant with requirements:
1. BSAF Corporation.
2. Carlisle Spray Foam Insulation.
3. Dow Chemical Incorporated.
4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Fifteen Minute Thermal Barrier:
1. Basis of Design: International Fireproof Technology, Inc. Fire-Lok DC-315 Fireproof Paint.
    a. A water-based latex intumescent coating.
    b. Proof of testing in accordance with both the UL-1715 15 minute Thermal Barrier and the NFPA 286 (AC-377 standards) supported by an ICC-ES report is required.
    c. 12 mils dry minimum.

2.05 INCIDENTAL SPRAY APPLIED THERMAL TREATMENT

A. Product for Type 1 Applications:
1. Product: ProSeal.
2. Manufacturer: Icynene.
3. Description: Professionally applied, two component, quick-cure polyurethane. Insulation dispenses, expands and becomes tack-free in seconds. The product will be completely cured in minutes. Insulation contains isocyanate, blowing agent and polyol.
4. Physical Properties:
    a. R-value: 7.1.
    b. Water vapor permeability: 0.97 perm at 1.5-inches.
5. Compliance:
    a. ICC ES ESR-3500
6. Fifteen Minute Thermal Barrier:
    a. Basis of Design: International Fireproof Technology, Inc. Fire-Lok DC-315 Fireproof Paint.
        1) A water-based latex intumescent coating.

2) Proof of testing in accordance with both the UL-1715 15 minute Thermal Barrier and the NFPA 286 (AC-377 standards) supported by an ICC-ES report is required.
3) 12 mils dry minimum.

7. Cautions:
   a. Do not breathe vapor or mist.
   b. Do not expose to temperatures above 240°F.

B. Product for Type 2 Applications:
1. Manufacturer:
   a. Isolatek; Cafco Blaze-Shield II: www.isolatek.com.
   b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Comply with ASTM E-84, Class 1.
3. Product shall not expand upon application.

2.06 SPRAY APPLIED ACOUSTICAL INSULATION

A. Manufacturer:
1. International Cellulose Corporation; K-13 Spray-applied insulation: www.spray-on.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Manufacturer shall be ISO 9001:2000 Certified.

C. Comply with ASTM E-736 for field-tested bond strength; tested at 5 years or more.
1. Not less than 400 psf.
2. Not less than 600 times its weight at 1 inch thickness.

D. Comply with ASTM E-84/UL 723, tested at a minimum of 5 inch thickness. Class 1, Class A:
1. Flame Spread: 5.
2. Smoke Development: 5.

E. Comply with ASTM E-1042.

F. Color: As selected from manufacturer's standard line.

G. Applicators:
1. Applied by an international network of licensed applicators through approved fiber machines and nozzles for control of the fiber/binder ratio. During application, the K-13 fibers are combined with a patented adhesive. The finished product is a strong, durable monolithic coating of a predetermined thickness. Some surfaces will require priming prior to being sprayed.
2. Applicator: Licensed by manufacturer.

H. Construction Sequence:
1. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.
2. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
3. Roof penetrations to be installed prior to application.

2.07 ACCESSORIES

A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Provide continuity of thermal barrier at building enclosure elements.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.03 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
1. Tape seal joints.
2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
1. Three continuous beads per board length.
2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
1. Place boards to maximize adhesive contact.
2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
1. Apply adhesive in five continuous beads per board length.
2. Install boards horizontally from base of foundation to top of insulation.
3. Butt boards tightly, with joints staggered from insulation joints.

3.04 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.
1. Place boards to maximize adhesive contact.
2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and protrusions.
4. Place impale fastener locking discs. Secure impale fasteners to substrate at following frequency: Six (6) Per insulation board.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Seal board joints and gaps with Penetration and Gap Filler and treat joints with Manufacturer's recommended exterior insulation joint sealant.
1. Seal around penetrations using Penetration and Gap Filler material.
2. Maintain continuity of air barrier by sealing the roof/wall juncture with Roof/Wall Juncture Sealing material.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.06 SPRAYED-APPLIED INSULATION

A. Appy according to manufacturer's written instructions.

B. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and items not indicated to recieve insulation are masked.

C. Install insulation is miscellaneous voids and cavity spaces where required to prevent gaps.

D. Where spray applied Polyurethane foam insulation is not covered with a gypsum board thermal barrier, apply Fifteen Minute Thermal Barrier.

3.07 PROTECTION

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

END OF SECTION

SECTION 07 25 11
WEATHER BARRIERS - FIRE RETARDANT FLUID APPLIED

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire Resistive, fluid-applied membrane to serve as vapor retarder, air barrier, and water-resistive barrier.
   1. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor-resistant and air tight.
   2. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.
   3. Water Resistive Barrier: Water does not leak through membrane or seams according to modified AATCC 127, 22 inch column of water for 5 hours.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 43 50-Air Barrier Systems: Additional administrative requirements related to this section.

B. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

C. Section 04 20 00-Unit Masonry: Substrate for application of weather barriers.

D. Section 05 40 00 - Cold-Formed Metal Framing:

E. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

F. Section 07 92 00 - Joint Sealers: Sealant materials and installation techniques.

G. Section 09 21 16 - Gypsum Board Assemblies: Exterior Sheathing.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials; 2013.

C. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2000 (Reapproved 2010).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2013.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
   1. Exterior wall assemblies incorporating the product and accessories shall be tested in accordance with and comply with the acceptance criteria of NFPA 285 wall assemblies on the Project.
   2. The following products shall be verified as part of the NFPA 285 wall assemblies on the project.
      a. Air Barrier
      b. Insulation
      c. Cladding

G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

H. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2013.

I. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc.; 2011.

J. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc.; 2012.

1.05 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
   1. List of wall assemblies tested to NFPA 285.
   2. Window head and floor line details incorporated in the NFPA 285 testing.
   3. ICC-ES Reports which confirm compliance with ICC-ES AC212 and ICC-ES AC148, Acceptance Material for Flashing Materials.
   4. Documentation that products are recognized as acceptable air barrier materials by the Air Barrier Association of America (ABBA).
   5. Compatibility:
      a. Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use.
         1) Silicone sealants specified in Section 07 92 00 - Joint Sealers:
            (a) Applications: Use for:
               (1) Exterior: Tie-in to fluid-applied air barriers and their accessory flashing materials, especially at perimeter of openings in exterior walls such as framed curtain wall, storefronts, windows, door frames, and louver frames.
               (2) Sealants were selected for compatibility with Basis of Design weather barrier product. If you are submitting a different product, it is critical that you provide documentation of compatibility with sealants.
      b. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with each of the adjacent materials proposed for use.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Warranty: Provide the manufacturer’s minimum five year material warranty.

1.06 MOCK-UP

A. Install air barrier, vapor retarder, and water-resistive barrier materials in mock-up specified in Section 04 20 00 Unit Masonry.

B. Install where directed.

C. Mock-up may not remain as part of finished work

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store weather barrier materials as recommended by weather barrier manufacturer

1.08 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 WEATHER BARRIER MATERIALS (AIR BARRIER AND WATER-RESISTIVE, FIRE RETARDANT FLUID APPLIED)

A. Weather Barrier (Class II Vapor retarder): Liquid applied, resilient, UV-resistant coating and associated joint treatment.
   1. Application: One-part spray or roller application.
   2. Composition:
      a. Fire resistant, flame-retardant, non-asphalt synthetic polymer.
      b. Water-based, air drying.
      c. Compatible with silicone and polyurethane sealants.
      d. UV-resistant - 6th month exposure.
   3. Nominal Dry Film Thickness: 40 mils (0.04 inch), minimum.
      a. High film thickness that can bridge cracks and seal around penetrations, creating a continuous, monolithic air, vapor and water barrier.
   4. Self-sealing: Provide self-sealing properties when penetrated with commonly used fasteners.
      a. ASTM D 1970: No water leaking through nail penetration after 24 hours.
   5. Water Vapor Permeance: Less than1.0 perm, when tested in accordance with ASTM E96, Method B.
   6. Air Permeance:
      a. Material < 0.001 L/(s*m^2@75 Pa per ASTM E 2178 (unmodified).
      b. Installed product and accessories shall exhibit an air leakage rate, infiltration and exfiltration modes, measured after pressure cycling, not to exceed 0.2 L/s*m2 at 75 Pa (0.040 CFM/ft2 at 1.57 PSF) according to ASTM E 2357.
   7. Water Resistive Barrier: Water does not leak through membrane or seams according to modified AATCC 127, 22 inch column of water for 5 hours.
   8. VOC Content: Less than 140 g per L when tested in accordance with 40 CFR 59 Subpart D (EPA Method 24).
   9. Resistance to Fungal Growth: No growth when tested according to ASTM D5590.
   10. Code Acceptance: Comply with applicable requirements of ICC-ES Acceptance Criteria AC 212.
   11. Fire Resistance Performance Requirements:
      a. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials:
         1) Class A, at full applied thickness (without the use of halogen or phosphorus flame retardants.)
            (a) Flame Spread: 25 or less.
            (b) Smoke developed: 450 or less.
   12. Suitable for use on concrete, masonry, plywood and gypsum sheathing.
   13. Joint Preparation Treatment: Coating manufacturer's recommended method, either tape or reinforcing mesh saturated with coating material.
   14. Products:
      a. Carlisle Coatings and Waterproofing, Inc.; Product: Fire Resist Barritech NP-LT; www.carlisle-ccw.com.
      b. W.R. Meadows, Inc.; Air-Shield LSR: www.wrmeadows.com.

c. NO SUBSTITUTIONS: All of the product options specified for use as wall system components have been carefully selected for compatibility with each other for compliance with NFPA-285, as documented by Third Party Selection Charts. For this reason, substitution requests are not permitted here.

2.02 ACCESSORIES

A. Additional materials and installation are required at joints, transitions, openings, terminations, penetrations and similar surface irregularities. Perform detailing before or after product installation.

B. Provide the following from same manufacturer as air barrier membrane:
   1. Detail Flashing: Foil-faced butyl or foil-faced rubberized asphalt flashing, minimum 0.030" (30 mils) thickness. Approved with air barrier membrane in NFPA 285 wall assemblies.
      a. AlumaGRIP-701 by Carlisle Coatings & Waterproofing, Incorporated
   2. Reinforcing Fabric: Woven, synthetic polymer fabric
      a. DCH Reinforcing Fabric by Carlisle Coatings & Waterproofing, Incorporated
   3. Glass Mat: Randomly-oriented glass strands held in binder soluble in wet air barrier membrane. Offered in rolls of various widths
      a. LiquiFiber-W
   4. Fill Compound: 2-part, non-sag polyurethane sealant
      a. Carlisle Coatings & Waterproofing, Incorporated: CCW-703 V or CCW-201.
   5. Sealant Backers: As specified in Section 07 92 00.
   6. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions affecting installation of the air & vapor barrier and accessory products for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing Work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the weather/air barrier installation.

B. Surfaces shall be sound, dry and free of oil, grease, dirt, excess mortar or other contaminants.

C. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.

D. Sheathing boards shall be flush at joints, with gaps between boards according to building code and sheathing manufacturer's requirements. Sheathing boards shall also be securely fastened to the structure with proper fastener type, technique and spacing according to building code and sheathing manufacturer's requirements. Sheathing boards shall be repaired or replaced if inspection reveals moisture damage, mechanical damage or if sheathing boards have exceeded the exposure duration or exposure conditions as required by the sheathing manufacturer.

E. Inform Architect in writing of
   1. Gaps or obstructions such as steel beams, angles, plates and projections which cannot be spanned or covered by Product or Accessories.
   2. Anticipated problems applying product and accessories over substrate.

F. Apply a ¾ inch cant of fill compound at the intersection of the base of the wall and the footing.

G. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

H. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or paintable sealant.

I. Fill rough gaps around pipe, conduit and similar penetrations with fill compound or polyurethane foam sealant shaved flush.

J. Clean and prime substrate surfaces to receive sealants in accordance with manufacturer's instructions.

3.03 DETAILING

A. Install product and accessories in details as directed in manufacturer's literature.

B. Sheathing joints, use any of the following methods:
1. 4 inch detail flashing centered over joint.
2. 4 inch reinforcing fabric imbedded in product and centered over joint.
3. Paintable sealant or fill compound, tooled as shown in details.

C. Sheathing inside and outside corners. Flashing or reinforcement shall bear 3 inches minimum onto either side of angle change. Use any of the following methods:
1. Minimum 9 inch detail flashing centered over angle change
2. 12 inch reinforcing fabric centered over angle change and imbedded in product
3. 12 inch glass mat centered over angle change and imbedded in product

D. Window openings. Flashing or reinforcement shall bear onto wall 3 inches minimum and shall return into window opening according to Project drawings. Use any of the following methods:
1. Detail flashing
2. Glass mat imbedded in product

E. Pipe or duct penetrations. Flashing or reinforcement shall bear onto wall 3 inches minimum and shall bear onto pipe or duct 3 inches, or according to Project drawings. Select any:
1. Detail flashing
2. Glass mat imbedded in product

F. Expansion or deflection joints. Flashing shall bear 3 inches minimum onto either side of joint. Select any:
1. Detail flashing bellows or expansion bulb
2. Transition membrane expansion bulb

G. Interface of dissimilar substrates: Flashing or reinforcement shall bear 3 inches minimum onto either side of joint. Select any:
1. Minimum 9 inch detail flashing
2. 12 inch reinforcing fabric imbedded in product
3. 12 inch glass mat imbedded in product

3.04 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Weather Barrier Product:
1. Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
2. Apply product over opaque wall surfaces as indicated in Project drawings.
3. Spray or roller-apply product to achieve specified thickness in accordance with manufacturer's literature.
   a. Apply to a minimum dry thickness of 40 mil.
   b. Apply a continuous unbroken air barrier to substrates to minimum thickness recommended by manufacturer.
4. Correct deficiencies in, or remove weather barrier that does not comply with requirements; repair substrates and reapply weather barrier components.

C. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.

2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over substrate; seal around anchors air tight.
3. Use flashing to seal to adjacent construction and to bridge joints.

3.05 SCHEDULE

A. Wall substrates and roof or temporary roof shall be in place, effectively enclosing interior space, before proceeding with weather barrier installation.

B. Seal penetrations made through installed product according to manufacturer's instructions and drawings.

C. Seal fenestration to product with detail membrane, transition membrane, polyurethane sealant, silicone sealant or polyurethane foam sealant according to Project drawings

D. Through-wall flashing may be installed before or after product. Seal termination of metal through-wall flashing to product with 6 inch width counter-flashing strip consisting of any of these:
1. Detail flashing
2. Reinforcing fabric imbedded in product
3. Glass mat imbedded in product

E. Cladding shall be installed after product.

F. Rigid or semi-rigid insulation installed over product shall be attached with insulation adhesive and mechanical fastening according to insulation manufacturer and air barrier manufacturer's instructions.

G. Sequence Work to enable air barrier continuity at wall-to-foundation, shelf angle, wall-to-roof, fenestration, different wall assemblies and other conditions providing challenges to air barrier continuity.

3.06 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing:
1. Cooperate with Owner's testing agency.
2. Allow access to work areas and staging.
3. Notify Owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.
4. Do not cover Work of this Section until testing and inspection is accepted.
5. Forward written audit reports to the Architect within 10 working days of the inspection and test being performed.
6. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

B. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
1. Test Procedure: A 4" bond disk is applied to an air barrier. The membrane is then scored down to the substrate. The pull tester is attached to the bond disc and pulled until the bond disc has achieved an adhesion failure. The maximum force to achieve adhesion failure and failure mode is recorded.
2. End Result: Upon the completion of a successful test, the weather barrier meets the performance criteria for adhesive strength or does not meet criteria and further remediation may be required to pass.
3. The minimum average of three tests are required to be 16 psi. This equates to a minimum average value on the test pull apparatus of 200.

C. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
1. Test Procedure: Air leakage detection fluid is applied over the brick tie and seam/lap in the air/vapor barrier. The chamber is equipped with a centrifugal blower and pressure sensing device to create the specified positive pressure differential inside the chamber. Any sites of air leakage are detected through the visual appearance of bubbles in the detection fluid.

2. End Result: Upon the completion of a successful test, the product meets the performance criteria for air infiltration resistance or does not meet criteria and further remediation may be required to pass.

D. ASTM E1186 (4.2.6) – Pass/fail criteria shall be no bubbles observed in the leak detection liquid

E. ASTM E1186 (4.2.7) – No major air leaks. A major leak is defined as air and smoke are visible and easily detectable by hand within one inch of the leak location(s)

3.07 PROTECTION

A. Protect from damage during application and remainder of construction period.

B. Inspect before covering. Repair or replace damaged material according to manufacturer's literature.

C. Product and accessories are not designed for permanent exposure. Cover with insulation or exterior cladding as soon as schedule allows.

D. Outdoor exposure of installed product and accessories shall not exceed manufacturer's published limit.

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

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Elastomeric roofing membrane, ballasted conventional and adhered conventional application.

B. Insulation, flat and tapered.

C. Deck sheathing.

D. Cover boards.

E. Flashings.

F. Roof pavers systems.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

C. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures 2010, with 2013 Supplements and Errata.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2021.

D. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane 2013.

E. NRCA (RM) - The NRCA Roofing Manual 2017.

F. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; Single Ply Roofing Institute; 2013 (ANSI/SPRI ES-1).

G. UL 1897 - Uplift Tests for Roof Coverings Systems.

H. FM 4474 - American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential ressure.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.05 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and paver layout.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience, and approved by manufacturer.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

D. Single Source Responsibility: Provide and install products from single source.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective work within a two year period after Date of Substantial Completion.

C. Basis of Design Warranty: Full system warranty; Firestone 20 year Red Shield Limited Warranty covering membrane, roof insulation, 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 manufacturer brand materials.
    c. Defective workmanship used to install these materials.
    d. Damage due to winds up to 100 mph.
3. Not Covered:
    a. Damage due to winds in excess of 100 mph.
    b. Damage due hurricanes or tornadoes.
    c. Hail.
    d. Intentional damage.
    e. Unintentional damage due to normal rooftop inspections, maintenance, or service.
4. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. EPDM Membrane Materials:

1. Basis of Design Product: RubberGard LS-FR by Firestone.

2. Carlisle Roofing Systems, Inc; Sure-Seal EPDM: www.carlisle-syntec.com/#sle.
3. Versico Roofing Systems; VersiGard EPDM: www.versico.com/#sle.

2.02 ROOFING - BALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: One-ply membrane loose-laid over insulation with ballast.

B. Ballast: Use pavers over entire roof area.

C. Application: Elevator overruns roof at elevators 1 and 2/3.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-monomer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M.
1. Thickness: 0.060 inch (60 mil).
2. Color: Black.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

A. Deck Sheathing: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 5/8 inch thick Type X.

2.05 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
1. Thickness: 5/8 inch, Type X, fire-resistant.
2. Basis of Design Products:
a. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com/#sle.

2.06 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
a. Type II:
1) Class 2 - Faced with coated polymer-bonded glass fiber mat facers on both major surfaces of core foam.
2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), nominal.
3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 2 - 8.0 (1.41) at 75 degrees F. Roof Average R-Value = R-40.
2. Board Size: 48 by 96 inches.
3. Board Thickness: 1.5 inch.
4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
5. Board Edges: Square.

2.07 ROOF PAVER BALLAST

A. Precast Concrete Roof Pavers: Precast concrete tiles, with texture and color as indicated; supported by adjustable pedestal system.
1. Comply with local wind load resistance requirements of ASCE 7.
2. Texture: As selected by Architect from manufacturer's standard line.
3. Length and Width: 23-7/8 by 23-7/8 inches, nominal.
4. Thickness: 2 inches, nominal.
5. Weight: 24 lb per square foot, nominal.
6. Modulus of Rupture: 650 psi, minimum.

2.08 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Insulation Adhesive: As recommended by insulation manufacturer.

C. Insulation Perimeter Restraint: Metal edge device configured to restrain insulation boards in position and provide top flashing over ballast.

D. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 GENERAL

A. Install roofing, insulation, 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.

1. Comply with the Online Evaluation Report for the specified roofing systems per the testing agency, ICC Evaluation Service, Underwriters Laboratory, Intertek, etc.

3.02 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.03 PREPARATION - METAL DECK

A. Install deck sheathing on metal deck.

1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
3. Tape joints.

B. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions.

1. Over entire roof area, fasten sheathing using six fasteners with washers per sheathing board.

3.04 INSTALLATION - INSULATION, UNDER MEMBRANE

A. Apply at ambient temperatures as low as 25 °F as long as it has been stored in a heated area so that it will be between 50 °F and 100 °F at the time of application.

B. All substrates must be primed with either Firestone SA Water Based Primer (W563587091) or Firestone SA Solvent Based Primer (W563587090) for Firestone V-Force product.

C. Membrane must be installed with minimum 3" side laps and 6" end laps

D. Install modified bitumen base sheet using the appropriate deck fasteners and insulation plates. Apply a second layer of modified bitumen base sheet in solid mopping of asphalt. Apply a glaze coat of asphalt over the base sheet.

E. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

F. Membrane should be rolled in with a 75 lb roller to fully mate each roll to substrate, including all lap areas.

G. Attachment of Insulation: Embed insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.

H. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions.

I. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

J. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

K. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

L. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

M. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

N. Lay roof insulation in courses parallel to roof edges.

O. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

P. Cold Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

Q. Drain Sumps:

1. According to NRCA, drains shall be located in square-shaped, gradually tapered sumps formed in the insulation to facilitate localized drainage at drains. Interior roof drain assembly occupy a 4-foot by 4-foot square area with a ½-inch per foot-tapered slope.
   a. At roof drains, use factory-tapered boards to slope down to roof drains.
   b. Use same type of roof insulation as specified for the remainder of roof work, but with the additional characteristics:
      1) Board Size: 24-inches by 24-inches, nominal.
      2) Sump Size 48 inches by 48 inches nominal.
      3) Thickness: Taper at 1/2-inch per foot.

3.05 INSTALLATION - MEMBRANE

A. Install elastomeric membrane roofing system in accordance with manufacturer's recommendations and NRCA (WM) applicable requirements.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:

1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Coordinate installation of roof drains and sumps and related flashings.

3.06 INSTALLATION - PAVERS AND EDGE TREATMENT

A. Install pavers in accordance with manufacturer's instructions.

1. Fully support edges; shim and adjust pavers to provide level surface.
2. Provide approximately 1/8 inch space between pavers to permit surface water drainage.

B. Paver Edge Restraints: Install exposed paver edge restraints in accordance with roof paver manufacturer's instructions.

3.07 FIELD QUALITY CONTROL

A. Owner will provide testing services in accordance with Section 01 40 00 - Quality Requirements, Contractor to provide temporary construction and materials for testing.

B. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

3.08 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including copings, gravel stops, flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

C. Reglets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.

C. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free 2007 (Reapproved 2012).

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2012).

G. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; Single Ply Roofing Industry; 2011. (ANSI/SPRI/FM 4435/ES-1)

H. NRCA (RM) - The NRCA Roofing Manual; 2017.

I. CDA A4050 - Copper in Architecture - Handbook current edition.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See 01 33 23 – Submittals, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 2 by 4 inch in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. See Drawings for Locations:

1. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 16 gauge, 0.05 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   a. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   b. Color: As selected by Architect from manufacturer's full range of colors.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/4 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 ROOF EDGE AND COPING FABRICATION

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.

1. Configuration: Fascia and edge securement for roof membrane.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Exposed Face Height: As indicated on drawings.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.

1. Configuration: Concealed continuous hold down cleat at outside face leg; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: As indicated on drawings.
5. Inside Face Height: As indicated on drawings.

2.04 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.

D. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.

E. Exposed Sealant: Type specified in Division 7 Section – Joint Sealers.

F. Plastic Cement: ASTM D4586/D4586M, Type I.

G. Reglets: Recessed type, rigid extruded PVC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Comply with drawing details.

B. Insert flashings into reglets to form tight fit; secure in place with plastic wedges; seal flashings into reglets with sealant.

C. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

END OF SECTION

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SECTION 07 81 00
APPLIED FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

B. Fireproofing of structural steel exposed to damage or moisture.

C. . Fireproof patching of existing structural steel, where required.
   1. Patch areas found to be non-compliant within construction limit lines.
   2. Patch areas disturbed by construction operations, such as for example: support of new distribution of electrical or mechanical items.
   3. Fireproof metal fabrications within 6-inches of structural steel members that they are supported from, except for existing fabrications that are already compliant with this requirement.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 05 31 00 - STEEL DECKING.

C. Section 07 05 53 - Fire and Smoke Assembly Identification.

D. Section 07 81 23 - Intumescent Fire Protection.

E. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members 2019 (Reapproved 2023).

B. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members 1992 (Reapproved 2023).

C. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members 1992 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.

F. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience

1.07 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. See Section 01 78 36-Warranties, for additional warranty requirements.

C. Correct defective Work within a two year period after Date of Substantial Completion.
1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 FIREPROOFING ASSEMBLIES

2.02 CONCEALED SFRM, INCLUDING AT POTENTIALLY WET AREAS, HIGH HUMIDITY AREAS, WITHIN RETURN AIR PLENUMS, UNCONDITIONED AREAS & WITHIN ELEVATOR & AIR SHAFTS:

A. Products: Subject to compliance with requirements, provide one of the following Medium Density, Portland Cement-based formulas:
1. Carboline Co., Fireproofing Products Div.; Pyrocrete 239.
2. Grace Construction Products; Monokote Type Z106.
3. Isolatek International Corp.; Cafco 400.

B. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
1. Dry Density: 22 lb/cu.ft. for ave. and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Bond Strength: 500 lbs/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
3. Compressive Strength: 7,200 PSF.

2.03 EXPOSED SFRM (EXCEPT FOR EXPOSED LOCATIONS WITHIN 8'-0" OF THE FLOOR):

A. Except for exposed locations within 8'-0" of the floor, use the same products in 2.02 that is where there is no ceiling or wall finish concealing fireproofing upon completion.
1. At temporary shelled spaces, that will not have ceilings for a short duration, use products in 2.02.

2.04 EXPOSED SFRM (FOR EXPOSED LOCATIONS WITHIN 8'-0" OF THE FLOOR):

A. For exposed locations within 8'-0" of the floor, Use one of the following products:

1. Southwest Fireproofing: 7HD.
2. Grace Construction Products: Monokote Type Z-146.
3. Isolatek International Corp.: Cafco Fendolite M-II.

B. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 40 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Bond Strength: 6,000 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
3. Compressive Strength: 350 PSI per ASTM E761.
4. Hardness: Shore 40 per ASTM D2240.

2.05 EXPOSED TO EXTERIOR ELEMENTS:

A. Use one of the following products:

1. Grace Construction Products: Z-156.
2. Isolatek International Corp: Cafco Fendolite M-II.

2.06 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fireproofing manufacturer.

B. Metal Lath: Expanded metal lath; minimum weight of 1.7 psf, galvanized finish.

C. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer adhesive in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

E. Apply overcoat at the rate recommended by fireproofing manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 45 29 Testing Laboratory Services

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

C. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

B. Section 07 81 00 - Applied Fire Protection.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2015.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops 2013a.

C. ITS (DIR) - Directory of Listed Products current edition.

D. FM 4991 - Approval Standard for Firestop Contractors 2013.

E. FM (AG) - FM Approval Guide current edition.

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168 current edition.

G. UL (FRD) - Fire Resistance Directory current edition.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, firestopping test or design number, and diagram of firestopping design.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.
   2. Verification of at least five satisfactorily completed projects of comparable size and type.

D. Provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

1.07 PROJECT STRATEGY FOR PERFORMING WORK

A. He who penetrates the assembly, firestops the penetration. (A separate fireproofing contractor sprays the structure while a multitude of trades install their own firestopping):
1. Masonry
2. Drywall
3. Plumbing
4. Fire Protection
5. HVAC
6. Electrical
   a. Power
   b. Communications
   c. Security

B. Alternative Practice: All work performed by ONE Specialty Trade.
1. Work of related trades is coordinated by firestopping contractor.
2. In this set-up, the Firestopping Contractor would be a subcontractor all trades requiring firestopping.

PART 2 PRODUCTS

2.01 MATERIALS

A. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating (at all conditions where required by applicable codes) and that meets all other specified requirements.
2. Provide systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
   a. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 deg F.
3. W-Rating Requirements:
   a. Description: Water-tight floor and wall through penetration firestop systems.
      1) To qualify as a Class 1 W-rated system, the firestop assembly must withstand a 3-ft head of water for 72 hours with no leakage.
   b. Applications: Firestopping in floor systems, for areas that require water resistance to provide protection against water from floor to floor. Floor penetrations above the following rooms:

1) Electrical rooms.
2) Information Technology Rooms.
3) Mechanical rooms, including Mechanical Penthouse.
4) Other locations where specifically indicated on Drawings.

c. Basis of Design Products: Hilti, Inc.
1) CFS-DID Drop-In Device
2) CFS-S SIL GG Firestop Silicone Sealant
3) CFS-S SIL SL Firestop Silicone Sealant
4) CFS SP WB Firestop Joint Spray
5) CFS SP SIL Firestop Silicone Joint Spray
6) CP 606 Flexible Firestop Sealant
7) CP 618 Firestop Putty Stick
8) CP 620 Fire Foam
9) CP 643N/644 Firestop Collar
10) CP 648-E/S Firestop Wrap Strip
11) CP 680-M/P/PX Cast-In Firestop Device
12) CP 681 Tub Box Kit
13) FS-ONE MAX High Performance Intumescent Firestop Sealant

2.03 FILL MATERIAL SCHEDULE

A. Manufacturers:
1. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
a. Specified Technologies, Inc.
b. Hilti, Inc.
c. 3M; Fire Protection Products Division.
d. Tremco; Sealant/Weatherproofing Division.

B. The following schedule is based on products by one manufacturer providing the quality standard to be used as the basis for comparison. Equivalency of products of other manufacturers shall be determined by Architect reviewing substitution requests provided during bidding, by bidder, in the form of a table comparing all performance criteria with product prividing the quality standard.

C. Provide products red in color, to distinguish it from non-fire-stop materials.

D. Sealants, caulking materials, or foams for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or sheet metal ducts penetrating floors, the following products are acceptable:
1. Hilti CFS-S SIL GG Firestop Silicone Sealant, Self Leveling.
2. Hilti CFS-S SIL GG Firestop Silicone Sealant, Gun Grade.
3. Sealants, caulking materials, or foams for use with cable bundles penetrating floors, the following products are acceptable:
4. Hilti CFS-S SIL GG Firestop Silicone Sealant.
5. Hilti CP 653 Firestop Speed Sleeve with integrated smoke seal fabric membrane.

E. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
1. Hilti CFS-S SIL GG Firestop Silicone Sealant.
2. Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Hilti CP 620 Fire Foam.
4. Hilti CP 606 Flexible Firestop Sealant.

F. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
1. Hilti CFS-S SIL GG Firestop Silicone Sealant.

2. Hilti CP 606 Flexible Firestop Sealant.
3. Hilti FS-ONE MAX Intumescent Firestop Sealant.

G. Intumescent sealants, caulking materials for use with combustible items (penetrant consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
1. Hilti CFS-S SIL GG Firestop Silicone Sealant.
2. Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Hilti CP 618 Firestop Putty Stick.
4. Hilti CP 620 Fire Foam.
5. Hilti CP 606 Flexible Firestop Sealant.
6. Hilti CP 653 Firestop Speed Sleeve with integrated smoke seal fabric membrane.
7. Hilti CFS-SL SK Firestop Sleeve Kit.
8. Hilti CFS-SL GP Firestop Gangplate used in conjunction with Hilti CP 653.

H. Sealants for use with fire-resistance-rated construction joints, the following products are acceptable:
1. Hilti CP 672 Speed Spray
2. Hilti CP 606 Flexible Firestop Sealant
3. Hilti CFS-S SIL GG Firestop Silicone Sealant.
4. Sealants for use as part of a Perimeter Fire Barrier System between fire-resistance-rated floors and exterior wall assemblies, the following products are acceptable:
5. Hilti CP 672 Speed Spray
6. Hilti CP 604 Self-leveling Firestop Sealant
7. Hilti CFS-S SIL SL Firestop Silicone Sealant.

I. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal deck profile; use as a backer for spray material.
1. Hilti CP 777 Speed Plugs
2. Hilti CP 767 Speed Strips

J. Intumescent sealants, caulking materials for use at the base of walls at shaft enclosures, the following products are acceptable:
1. Hilti CFS-S SIL GG Firestop Silicone Sealant.

2.04 PERIMETER FIRE-RESISTIVE JOINT SYSTEMS

A. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated as determined by NFPA 285 and UL 2079. Integrity ratings equaling or exceeding fire resistance ratings of floor or floor/ceiling assembly forming one side of joint.

B. Fire Protection Insulation In Perimeter Curtain Wall Firecontainment Systems: See Fire Safing Insulation, below.

2.05 FIRE SAFING INSULATION

A. Fire Safing Insulation: Thermafiber, FireSpan 40 complying with the following:
1. ASTM C 665 Type I, III (Class A, Category 1).
2. ASTM C 612 FireSpan 40 Type IA, IB, II, III, IVA, IVB.
3. ASTM E 136 Rated Non-combustible per NFPA Standard 220.
4. ASTM E 96 Unfaced, 50 Perms as tested.
5. ASTM E 96 Foil Faced, 0.02 Perms as tested.
6. ASTM C 1104 Sorption less than 1% by volume.
7. ASTM C 356 Linear Shrinkage <2% @ 1200º F (650º C).
8. ICC ES Report ER-2331.
9. Recycled Content: EPA Choice Fiber (US Government Buildings): 75%.

B. Approved equivalent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

D. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

D. Install labeling required by code.

3.04 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed.

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner to engage a qualified, independent inspecting agency to inspect Work of this Section, including those related to qualifications, conducting inspections, and preparing test reports:

1. Through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements.
2. Fire Stop Joint Systems. Independent inspecting agency shall comply with ASTM E 2393 requirements.

B. Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds.

1. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
2. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
3. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

C. Where deficiencies are found, repair or replace systems so they comply with requirements.

3.06 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.07 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 13 00 - Sheet Waterproofing: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.

B. Section 07 25 11 - Weather Barriers - Fire Retardant Fluid Applied: Sealants required in conjunction with air barriers and vapor retarders.

C. Section 07 84 00 - Firestopping: Firestopping sealants.

D. Section 07 95 13 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

E. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.

F. Section 08 80 00 - Glazing: Glazing compounds.

1.03 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2015.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2012.

C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2000 (Reapproved 2011).

D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2013.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2008 (Reapproved 2012).

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168 current edition.

1.04 SUBMITTALS

A. See Section 01 33 23 – Submittals, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
8. Sample product warranty.
9. Include project specific joint sealant schedule including the following:
   a. Sealant Type # as defined per this specification Section.
   b. Manufacturer and product.
   c. Adjacent materials and associated sealant Colors.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: To Architect, submit at least two physical samples for verification of color of each required sealant.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of experience.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
   4. Allow sufficient time for testing to avoid delaying the work.
   5. Deliver to manufacturer sufficient samples for testing.
   6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 43 39.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.07 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.
   1. Non-Stain Warranty:
      a. Twenty year period after Date of Substantial Completion.
      b. Manufacturer shall pre-approve and test as required per conditions of warranty.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
   c. Joints between counter tops/back and side splashes, and adjacent walls.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.
   f. Joints at horizontal terminations in EIFS wall system, including base of wall and heads of openings, intended for system drainage.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Color of Sealant, generally, shall be the color of the adjacent material that lies in the same plane as the sealant. Verify all colors with Architect prior to installation.

C. Carefully study the Drawings and furnish and install the proper sealant and caulking at each point where indicated on the Drawings plus at all other points where sealants and caulking are essential in maintaining the continued integrity of the weather-tight barrier.

D. Joint locations and conditions not covered in the schedule below shall be brought to the attention of the Architect. The contractor shall propose, in writing, sealant types for each joint location and condition in question, to the Architect for approval prior to sealant installation.

2.03 SEALANT SCHEDULE

A. Type 1 - Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, A, G, M, O; single component (Type S), neutral curing, non-sagging, medium-modulus, Mid Shore A hardness, stain tested (ASTM C1248).
   1. Color: To be selected by Architect from manufacturer's full range.
   2. Movement Capability: Plus and minus 50 percent.
   3. Applications: Use for:
      a. Exterior: Joints in exterior vertical surfaces and non-traffic horizontal surfaces such as the following:
         1) Cast-in-place concrete.
         2) Precast concrete.
         3) Concrete Masonry.
         4) Glass Unit Masonry.
         5) Brick.
         6) Stone [Except for Stone Panel Cladding (Granite, Marble, Etc.)].
         7) Cornice and wash joints
         8) Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers, and similar openings.
         9) Metal flashings and reglet joints.
         10) Gravel stops, fascias and copings.
         11) Mechanical and electrical penetrations of the building envelope.

12) Exterior joints for which no other sealant Type is indicated

b. Interior:

1) Concealed joints on the interior side of exterior wall surfaces.

(a) Vertical control joints.

(b) Concealed joints on the interior side of exterior precast concrete (Except when the Precast Manufacturer's product data specifically directs the use of Type 1 joint sealant.)

(c) Interior perimeters of mechanical and electrical items which penetrate the exterior building facade.

2) Interior exposed control joints in unpainted masonry walls.

3) Interior perimeters of exterior openings where opening frames meet wall surfaces.

4) Joints in tile walls.

5) Joints in kitchen counter tops and work surfaces.

6) Joints between food service equipment and surrounding construction.

7) Other interior joints, where incidental food contact may occur.

4. Products:

a. Dow Corning Corporation; 795: www.dowcorning.com.

b. Momentive Performance Materials, Inc (GE Silicones products); Silpruf SCS2000.: www.momentive.com.

c. Pecora Corporation; 895NST Medium Modulus Structural Glazing & Weatherproofing Silicone Sealant - Class 50: www.pecora.com.

d. Tremco Global Sealants; Spectrem 2: www.tremcosealants.com.

e. Substitutions: Not permitted.

B. Type 3 - Silicone Sealant: ASTM C920, Grade NS, Class 100, Uses NT, A, G, M, O; single component (Type S), neutral curing, non-sagging, medium-modulus, Mid Shore A hardness, stain tested (ASTM C1248).

1. Color: To be selected by Architect from manufacturer's full range.

2. Movement Capability: Plus and minus 100 percent.

3. Applications: Use for:

a. Exterior: Tie-in to fluid-applied air barriers and their accessory flashing materials, especially at perimeter of openings in exterior walls such as framed curtain wall, storefronts, windows, door frames, and louver frames.

4. Products:

a. Dow Corning Corporation; 758 or 790: www.dowcorning.com.

b. NO SUBSTITUTIONS: All of the product options specified for use as wall system components have been carefully selected for compatibility with each other for compliance with NFPA-285, as documented by Third Party Selection Charts. For this reason, substitution requests are not permitted here.

C. Type 4 - Acoustical Sealant for Concealed Locations: Class 7.

1. Composition: Acrylic latex emulsion sealant.

2. Applications:

a. Use for concealed interior locations only:

1) Joints at tops of non-load bearing masonry walls at the underside of roof or floor decks.

2) Tops of non fire-rated partitions.

3) Sealant bead between top stud runner and structure and between bottom stud track and floor.

4) Penetrations through non fire-rated partitions.

3. Products:

a. Hilti; Smoke and Acoustic Sealant (CP 506)

b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.

c. USG; Sheetrock Brand Acoustical Sealant: www.usg.com

d. Tremco Incorporated: Acoustical Sealant.
e. Substitutions: Not permitted.

D. Type 5 - Bathtub/Tile Sealant: White or Clear silicone (as selected); ASTM C920, Uses I, M, A, and NT; single component, mildew resistant, acid curing, non-sag, Class 25.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Applications: Use for:
a. Interior
1) Joints between plumbing fixtures and non-porous floor and wall surfaces.
2) Joints between kitchen countertops and wall surfaces.
3) Joints between toilet room vanities, countertops and splashes and walls.
4) Other interior joints in wet areas where needed to limit mold and mildew growth.
3. Products:
a. Dow Corning Corporation; 786-M.
b. Momentive Performance Materials Inc.; GE Construction Sealants: SCS1700 Sanitary
c. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.
d. Tremco Global Sealants; Tremsil 200: www.tremcosealants.com.
e. Substitutions: Not permitted.

E. Type 9 - Acrylic Emulsion Latex: ASTM C834, single component, non-staining, non-bleeding, non-sagging, Type OP, Grade NF.
1. Color: White.
2. Movement Capability: +-12.5 percent.
3. Applications: Use for:
a. Interior:
1) Control joints in exposed joints of drywall partitions and ceilings.
2) Perimeter joints of walls including wall-to-wall intersections and wall-to-floor intersections.
4. Products:
a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com.
b. BASF Construction Chemicals-Building Systems; Sonolac: www.buildingsystems.basf.com.
c. Tremco Global Sealants; Tremflex 834: www.tremcosealants.com.
d. Substitutions: Not permitted.

F. Type 10 - Non-skinning, Non-hardening, Flexible, Synthetic Butyl Sealant.
1. Applications: Use for applications as indicated on Drawings.
2. Products:
a. Pecora Corporation; BA-98.
b. Tremco Incorporated; Trempro JS-733.
c. Substitutions: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

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

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for wall and roof surfaces.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Placement of joint cover assembly frames in masonry.

B. Section 07 53 00 - Elastomeric Membrane Roofing: Roofing tie-ins to adjacent existing buildings at expansion joints.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Reglets and counter flashings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles 2010.

1.04 SUBMITTALS

A. See Section 01 33 23 – Submittals, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Basis of Design: InPro Architectural Products: www.inprocorp.com.
   2. Acceptable alternate manufacturers subject to compliance with requirements.
      a. Construction Specialties, Inc: www.c-sgroup.com.
      b. Pecora Corporation: www.pecora.com.

2.02 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of bulk water.
   1. Building Expansion Joint: A building expansion joint is required between the new building and the existing buildings to the North and South to accommodate the following movement criteria:
      a. 4 inches of compression (opposing buildings moving a maximum 2 inches towards each other in the North/South direction).
      b. 4 inches of expansion (opposing building moving a maximum 2 inches away from each each other in the North and South direction).

c. 3 inches of non-vertical shear (opposing buildings moving a maximum 1-1/2 inches towards or away from each other in the East.West direction).

2. Joint Dimensions and Configurations: Varying gap widths exist between the new and existing building due to the configuration of the exterior walls of the existing building.
3. Joint Cover Sizes: As indicated on Drawings.
4. Joint Cover Styles: As indicated on drawings.
5. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
6. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish Outdoors: Natural anodized.

B. Resilient Seals:
   1. For Roof to Wall Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.

C. Anchors and Fasteners: As recommended by cover manufacturer based on context of application.

D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

2.04 FABRICATION

A. Provide joint components in single length wherever practical. Minimize site splicing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level.

C. Rigidly anchor to substrate to prevent misalignment.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

D. Hollow metal borrowed lites glazing frames.

E. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

E. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames 2007 (R2011).

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2003 (R2009).

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2014.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

J. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2014.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

L. ITS (DIR) - Directory of Listed Products current edition.

M. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames 2007.

N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2006.

O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2016.

P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2016.

Q. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives; 2010.

R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2012.

S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.

T. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

V. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an

exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thermal Resistance: R-Value of 2.7.
   4. Door Thickness: 1-3/4 inches, nominal.
   5. Top Closures: Flush with top of faces and edges.
   6. Door Face Sheets: Flush.
   7. Weatherstripping: Refer to Section 08 71 00.
   8. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Door Thickness: 1-3/4 inches, nominal.
   3. Door Face Sheets: Flush.
   4. Door Finish: Factory primed and field finished.

C. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
         1) A door labeled for UL 10C positive pressure compliance must be installed in each of these door frames.
      b. Attach fire rating label to each fire rated unit.
         1) These frames also meet the requirements of UL 10B, NFPA 252, and ASTM E-152.
      c. Smoke and Draft Control Doors (Fire rated door assemblies in corridor walls, smoke barriers, elevator lobbies, and stair doors, shall comply with requirement for smoke and draft control. See Life Safety Drawings for walls with these designations): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
         1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
         2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
            (a) Provide gasketing/edge sealing National Guard #2525:

3) Label: Include the "S" label on fire-rating label of door.

3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
4. Door Thickness: 1-3/4 inches, nominal.
5. Door Face Sheets: Flush.
6. Temperature-Rise Limit: At vertical exit enclosures, exit passageways and at other locations where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
7. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. General:
1. Comply with the requirements of grade specified for corresponding door.
a. ANSI/SDI A250.8 (SDI-100), Level 2 and 3 Door Frames: 14 gage, 0.067 inch, minimum thickness.
2. Finish: Factory primed and field finished.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
5. Full profile/continuously welded type.

D. Exterior Door Frames: Full profile/continuously welded type.
1. Basis of Design: Ceco Door, ASSA ABLOY, Mercury Thermal Break Steel Frames
2. Incorporates a bonded thermal break with Pemko S44 compression weather-stripping
3. Independently tested for thermal performance with Trio-E (0.36 U-Value) in accordance with NFRC 102-2014 and ASTM test methods.
4. Install with manufacturers associated thermal anchors.
5. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
6. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.

E. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

F. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

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

2.06 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Astragals for Double Doors: Specified in Section 08 7100.

C. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 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. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Smoke-Control Doors: Install doors according to NFPA 105.

D. Coordinate frame anchor placement with wall construction.
1. A minimum of 1/2” penetration of gypsum wall board is required at all drywall frames.

E. Solidly pack mineral-fiber insulation behind frames.

F. Install door hardware as specified in Section 08 71 00.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

G. Comply with glazing installation requirements of Section 08 80 00.

H. Coordinate installation of electrical connections to electrical hardware items.

I. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors, operating hardware, fire-rated, electric operation.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 26: Conduit from electric circuit to operator and from operator to control station.

C. Divison 26: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

D. ITS (DIR) - Directory of Listed Products current edition.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2014.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000 (R2005), with errata, 2008.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2016.

H. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide general construction and electrical equipment.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required .

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Provide five year manufacturer limited warranty against defects in materials and workmanship. (Spring wire 1 year)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Fire Doors:
   1. C.H.I. Overhead Fire Doors; Model 7301: www.chiohd.com/#sle.
   2. Clopay Building Products; Model CERD10: www.clopaydoor.com/#sle.
   3. Wayne-Dalton, a Division of Overhead Door Corporation; Firestar Model 700: www.wayne-dalton.com/#sle.

2.02 COILING DOORS

A. Fire-Rated Coiling Doors: Steel slat curtain; conform to NFPA 80.
   1. 1 hour fire rating.
   2. Provide products listed and labeled by ITS (DIR), UL (DIR), ITS (DIR), or UL (DIR) as suitable for the purpose specified and indicated.
   3. Nominal Slat Size: 2 inches wide by required length.
   4. Finish: Factory painted, color as selected.
   5. Guides, Angles: Galvanized steel.
   6. Hood Enclosure: Manufacturer's standard; galvanized steel.
   7. Coiling Door Release Mechanism: Fusible link activated with automatically governed closing speed.
   8. Electric operation.
   9. Mounting: Surface mounted.

2.03 MATERIALS

A. Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

B. Steel Slats: Minimum thickness, 22 gage, 0.0299 inch; ASTM A653/A653M galvanized steel sheet.
   1. Galvanizing: Minimum G90 coating.

C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

D. Guides - Angle: ***ASTM A36/A36M*** metal angles, size in accordance with manufacture standards.
   1. Hot-dip galvanized in compliance with ***ASTM A123/A123M.***

E. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
   1. Minimum thickness; 24 ga.

F. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.

G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Motor Rating: 1/3 hp; continuous duty.
   2. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   3. Controller Enclosure: NEMA 250, Type 1.

4. Opening Speed: 12 inches per second.
5. Brake: Adjustable friction clutch type, activated by motor controller.
6. Manual override in case of power failure.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
1. 24 volt circuit.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Division 26.

G. Complete wiring from disconnect to unit components.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

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SECTION 08 41 24
FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Fire rated glazing and framing systems for installation as [sidelights,] [borrowed lights,] [windows,] and [transoms] or [wall sections] in interior openingsVerify other nearby items are specified. These include concrete and masonry inserts, concealed flashing.

B. Related Sections:
   1. Section 05 12 00 “Structural Steel Framing:” Steel attachment members
   2. Section 05 50 00 “Metal Fabrications:” Steel attachment members inserts and anchors
   3. Section 07 25 11 “Weather Barriers, Fire-Retardant, Fluid-Applied:” Perimeter air, water and vapor seal between the work of this section and adjacent construction
   4. Section 07 62 00 “Sheet Metal Flashing and Trim” Flashing between this work and other work
   5. Section 07 84 00 “Firestopping:” Firestops between work of this section and other fire resistive assemblies.
   6. Section 07 92 00 – “Joint Sealants” for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
   7. Section 08 71 00 “Door Hardware:” Door hardware other than that provided by the work of this section

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. Fire safety related:
      a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   2. Material related
      a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
      b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.
   3. Exterior-related:
      a. ASTM E 283-04: Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
      b. ASTM E 330-02: Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference Procedure A
      c. ASTM E 331-04: Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
      d. ASTM E 783-02: Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors

e. ASTM E 1105-00: Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference

C. American Welding Society (AWS)
1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.
1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):
1. NFPA 80: Fire Doors and Windows.
2. NFPA 251: Fire Tests of Building Construction & Materials
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):
1. UL 9: Fire Tests of Window Assemblies.
2. UL 10 B: Fire Tests of Door Assemblies
3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
4. UL 263: Fire tests of Building Construction and Materials
5. UL-752 Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):
1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

I. American Society of Civil Engineers (ASCE)
1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 23.

B. Product Data:
1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:
1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure

D. Structural Calculations :
1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.

E. Samples. For following products:
a. Sample of frame
b. Verification of sample of selected finish

F. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

G. Warranties: Submit manufacturer's warranty.

H. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program

involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for Testing Body-Building Materials and Systems
      1) Fire Testing
         (a) ASTM Standards E 119
         (b) CPSC Standards 16 CFR 1201
         (c) NFPA Standards 251, 252, 257
         (d) UL Standards 9, 10B, 10C, 1784, UL Subject 63
         (e) BS 476; Part 22: 1987
         (f) EN 1634-1
         (g) CAN/ULC Standards S101, S104, S106

B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9. For 45-minute assemblies only.

C. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.06 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.

B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.07 WARRANTY

A. Provide the standard five-year manufacturer warranty for glass and framing system.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Fire rated glass and framing must be provided by a single-source, US manufacturer.

B. Basis of Design - Technical Glass Products (TGP); Fireframes: www.fireglass.com
   1. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site http://www.fireglass.com
   2. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300 e-mail sales@fireglass.com web site http://www.fireglass.com

C. Acceptable alternate manufacturers products subject to compliance with requirements: Safety And Fire Technology, Inc.; GPX Architectural Series; www.safti.com
   1. Manufacturer of Glazing Material: (SuperLite® II-XL) (SuperLite® II-XL IGU) (SuperLite® II-XLB) (SuperLite® II-XLM) as manufactured and distributed by SAFTI *FIRST*® Fire Rated Glazing

Solutions. Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653. 3333; Fax 888.653.4444; email info@safti.co; Web site www.safti.com

2. Manufacturer of Framing System: GPX Architectural Series Framing as manufactured and distributed by SAFTI *FIRST*® Fire Rated Glazing Solutions. Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653. 3333; Fax 888.653.4444; email info@safti.co; Web site www.safti.com

2.02 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format
      a. Face widths available:
         1) 2”
         2) Custom extruded aluminum cover caps
      b. Duration – Windows Capable of providing a fire rating for 60 and 120 minutes.

B. Structural Performance
   1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
   2. Positive wind load: as indicated on the drawings.
   3. Negative wind Load: as indicated on the drawings.
   4. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass][1/175 of the glass edge length or ¾ inch, whichever is less][of any framing member
   5. Accommodate movement between storefront and adjoining systems

C. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft2 at a static air pressure differential of 6.24 psf.

D. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.Coordinate the lb/ft2 with those required in the field test at the end of the section.

2.03 MATERIALS - GLASS

A. Low-E Coated glass for use in insulated exterior units See Section 08 80 00

B. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.

C. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).

D. Properties Interior Glazing- Basis of Design Product.

Fire-Rating	45 minute	60 minute		120 minute
Manufacturer’s designation	45-200	60-101	60-201	120-106
Glazing type	single	single	single	IGU
Nominal Thickness	3/4” (19mm)	7/8” (23mm)	1-1/16” (27mm)	2-1/4” (57mm)
Weight in lbs/sf	9.2	10.85	12.5	22.9
Daylight Transmission	86	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

E. Properties Exterior Glazing- Basis of Design Product.

Fire-Rating	45 minute		60 minute		120 minute
Manufacturer's designation	45-200	45-260 45-360	60-201	60-261 60-361*	120-262 120-362*
Glazing type	single	IGU	single	IGU	IGU
Nominal Thickness	3/4" (19mm)	1-5/16" (33mm)	1-1/16" (27mm)	1-5/8" (41mm)	2-3/8" (60mm) [with 14 mm spacer, or 2-1/8" (54 mm) with 8 mm spacer]
Weight in lbs/sf	9.2	12.5	12.5	15.8	22.1
Daylight Transmission	86	77 59-71	86%	77% 59-70%	74% 33-68%
Sound Transmission Coefficient	40dB	40dB	44dB	44dB	46dB

1. * = Low-E product.

F. Exterior Grade: PVB inner layer installed toward exterior.

G. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

H. Glazing Accessories: Manufacturer's standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

2.04 MATERIALS –ALUMINUM FRAMES

A. Aluminum Framing System - 60 min. 120 min.

1. Steel Frame — The steel framing members are made of two halves, with a nom. minimum depth of 1.38 in. (or manufacturers standard) with lengths cut according to glazing size.
2. Aluminum Trim — Supplied with the steel framing members. Nom. 2 in. wide with a nom. depth of 1.54 in. (or manufacturer standard) with lengths cut according to glazing size.
3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. diameter with a nom. minimum depth of 1 1/8 in. (or manufacturer standard) with depth adjusted to match manufactures panel thickness.
4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. thick with a nom. minimum depth of 1 1/8 in. (or manufacturer standard) with depth adjusted to match manufacturers panel thickness.
5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.
6. Glazing Gasket —
   a. Interior Gasketing-Supplied with the steel framing members. Manufacturer standard, or Nom. 3/4 in. (19 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.
   b. Exterior Gasketing- Supplied with the steel framing members. Manufacturer standard, or Nom. 2 in. (50 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M Standard Specification for Carbon Structural Steel
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
   3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.

2.05 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets: Manufacturers standard.
   1. In the absence of a manufacturer standard, provide ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: Manufacturer standard. In the absence of a manufacturer standard, provide ¼" Calcium silicate or manufacturer standard.

E. Perimeter Anchors: Steel.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: Manufacturers standard. In the absence of a manufacturer standard, provide one-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
   1. Available Products:
      a. Dow Corning 790, 795 - Dow Corning Corp.
      b. Momentive
      c. Tremco

H. Intumescent Caulk: Manufacturers standard. In the absence of a manufacturer standard provide single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
   1. Available Products:
      a. 3M CP-25 WP+

2.06 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
   1. Fibrex Insulations Inc.
   2. Owens Corning
   3. Thermafiber.

4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
   2. Fiber Color: Regular color, unless otherwise indicated.

2.07 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

C. Field glaze door and frame assemblies.

2.08 FINISHES

A. Finish after fabrication

B. Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable

C. Aluminum Finishes
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 REPAIR AND TOUCH UP

A. Anodized Finishes
   1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
   2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.
   3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.

B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.04 PROTECTION AND CLEANING

A. Protect glass from damage immediately after inst allation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

1. Do not clean with astringent cleaners. Use a clean “grit free” cloth and a small amount of mild soap and water or mild detergent.
2. Do not use any of the following:
   a. Steam jets
   b. Abrasives
   c. Strong acidic or alkaline detergents, or surface-reactive agents
   d. Detergents not recommended in writing by the manufacturer
   e. Do not use any detergent above 77 degrees F
   f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
   g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating su bstances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

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SECTION 08 42 29
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged power-operated door assemblies of following types:
   1. Sliding type.

B. Operators (for swing doors provided in other sections).

C. Controllers, actuators and safety devices.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - "Joint Sealants."

B. Section 08 71 10 - “Door Hardware” for lock cylinders.

C. Section 08 80 00 - "Glazing” for glazing requirements.

D. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance operators and access-control devices.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

C. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes 2014.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
   2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.

C. Product Data: Provide data on system components, sizes, features, and finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.

F. Maintenance Contract.

G. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Wrenches and other tools required for maintenance of equipment.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

C. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

D. Operating Temperature Range: Provide automatic entrances that operate within minus 30 to plus 120 deg 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 6.24 lbf/sq. ft.

F. Opening-Force Requirements:
   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.
   3. Accessible Interior Doors: Not more than 5 lbf to fully open door.

G. Entrapment Force Requirements:
   1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

H. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience, and a member of AAADM.

I. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years experience and approved by manufacturer.

1.06 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty for motor and compressor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. All-Glass Sliding Automatic Entrance Door Assemblies:
   1. ASSA ABLOY Entrance Solutions; Besam SL500 CGL All Glass Slider: www.besam-usa.com/#sle.
   2. Horton Automatics: www.hortondoors.com/#sle.
   3. Stanley Access Technologies; Dura-Glide All Glass 2000: www.stanleyaccess.com/#sle.

2.02 PACKAGED AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. Sliding Automatic Door: Single leaf track-mounted, electric operation, extruded aluminum glazed door, with frame, and operator concealed overhead.
   1. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.
   2. Operation: Power open, power close operation.
   3. Automatic Entrance:
      a. Manufacturer’s Products:

1) Type 1:
(a) Single slide-by with transom.
(b) Emergency Breakaway Capability: Sliding leaf
(c) Traffic Pattern: Two way.

4. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
5. Sliding Door Operators: In the event of power failure, provide for manual open, close, and break-away operation of door leaves.
   a. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
6. Sliding and Folding Doors with Full Power Operators: Comply with BHMA A156.10; safeties required; provide break-away operation unless otherwise indicated; in the event of break-away operation, interrupt power operation.
7. Comply with UL 325; acceptable evidence of compliance includes UL (DIR) or ITS (DIR) listing or test report by testing agency acceptable to authorities having jurisdiction.
   a. Force Required to Swing Break-Away Panel: 50 pound-force, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.
   b. Door Operators for Automatic Entrances:
8. Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.
9. Door Operator Performance: Provide door operators that will open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
   a. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds.
   b. Provide capability for switching between bidirectional and unidirectional detection.
10. Presence Sensors: Self-contained, infrared-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of 1.5 seconds fixed. Sensors shall remain active at all times.
    a. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.
    b. Opening-Width Control: Two-position switch that in the normal position allows sliding doors to travel to full opening width and in the alternate position reduces opening to a selected partial opening width.
11. Door and Frame Finish: Anodized, clear anodized.
    a. Architectural Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Clear coating 0.018 mm or thicker complying with AAMA 607.1.
    b. Concealed Steel Items: Galvanized in accordance with ASTM A123 to thickness Grade 85, 2.0 oz/sq ft.

2.03 CONTROLLERS, ACTUATORS, AND SAFETIES

A. Typical Activation (except where "High Energy" is required):
   1. Infrared Touchless Wall Switch.
      a. Locate wall switch 8'-0" from doors where possible; at locations indicated as CR (card Reader) badge swipe action shall initiate auto-operator without secondary hand wave.
      b. Approach side sensor shall be installed horizontally on the approach side of each door leaf:

2.04 HARDWARE

A. Electric Solenoid Locks: Package to include concealed electronic solenoid in header for fail secure locking to secure slide channel. Automatic openers to be equipped with prewired cable for monitoring breakout and slide channel. (The interior doors of the primary entrance vestibule shall be secured after hours with code compliant electric solenoid locks.)

B. Concealed Vertical Rod Exit Devices: Code compliant.

C. Remote switch: To convert door operation from standard daytime automatic operation to after hours secured function.

D. Thresholds: BHMA A156.21, extruded-aluminum raised thresholds; with beveled edges with a slope of not more than 1:2 and a maximum height of 1/2 inch. Provide cutouts as required for door operating hardware.

E. Weather Stripping: Manufacturer's standard replaceable components.
   1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.05 ACCESSORIES

A. Steel Clips, Supports , and Steel Anchors: Galvanized to 1.25 oz/sq ft.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

C. Signage: Affixed to both sides of each door as required by BHMA A156.10 and BHMA A156.19 for type of door and its operation.
   1. Application Process: Door manufacturer's standard process.
   2. Provide sign materials with instructions for field application after glazing is installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.

C. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.

D. Provide for dimensional distortion of components during operation.

E. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

3.04 CLEANING

A. Remove temporary protection, clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.06 MAINTENANCE

A. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.
   1. Work shall be performed by skilled employees of automatic entrance Installer.

2. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation at rated speed and capacity.
3. Engage a certified inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
4. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

E. Perimeter sealant.

F. Acoustical Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 25 11-Weather Barriers-Fire Retardant, Fluid Applied: Sealing framing to weather barrier installed on adjacent construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 42 29 - Automatic Entrances.

D. Section 08 51 13 - Aluminum Windows: Fixed window wall windows.

E. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

F. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site 2015.

B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage 2009.

C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems 2014.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.

G. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

H. ASCE 7 - Minimum Design Loads for Buildings and Other Structures 2010, with 2013 Supplements and Errata.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

L. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2009).

O. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting minimum one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required. Provide project specific details illustrating adjacent materials, flashings, and

D. Samples: Submit two samples 2x4 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Exterior Storefront:
      a. Kawneer North America; Product - Trifab 601T: www.kawneer.com
         1) Kawneer IsoLock™ Thermal Break with a 1/4" separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
         2) Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
      b. Acceptable alternate manufacturers subject to complaicne with requirements:
         1) Tubelite's TU24650 Therml Block.
         2) EFCO XTherm Series 406X (T)
   2. Interior Storefront:
      a. Basis of design: Kawneer North America; Product 451. www.kawneer.com
      b. Acceptable alternate manufacturers subject to complaicne with requirements:
         1) Tubelite's: E24650 Series non-thermal storefront
         2) EFCO: Series 402 (NT)

B. Aluminum-Framed Storefront and Doors:
   1. Exterior Swing Doors: Glazed aluminum.
      a. Basis of Design: Kawneer 350T series Insulpour Thermal Performance Doors.
         1) U-factor: 0.52.
         2) CRF: 49.
         3) Thickness: 1-3/4 inches.
         4) Medium Stile:
            (a) Top Rail: 3-1/2 inches wide.
            (b) Vertical Stiles: 3-1/2 inches wide.
            (c) Bottom Rail: 10 inches wide.
         5) Glazing Stops: Square.
         6) Finish: Same as storefront.
      b. Acceptable alternate manufacturers subject to complaicne with requirements:
         1) Tubelite's Medium Stile Therml=Block.
         2) EFCO Medium Stile Thermal Series D302
   2. Interior Swing Doors: Glazed aluminum.
      a. Basis of Design: Kawneer 350 series.
         1) Thickness: 1-3/4 inches.
         2) Medium Stile:
            (a) Top Rail: 3-1/2 inches wide.
            (b) Vertical Stiles: 3-1/2 inches wide.
            (c) Bottom Rail: 10 inches wide.
         3) Glazing Stops: Square.
         4) Finish: Same as storefront.
      b. Acceptable alternate manufacturers subject to complaicne with requirements:
         1) Tublite's Medium Stile standard doors
         2) EFCO Medium Stile Standard Series D300

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Front-set.
   2. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements:
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
   3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
   4. Condensation Resistance Factor (CRF):
      a. Front-set style: The glass to exterior CRF, when tested to AAMA Specification 1503, shall not be less than 68_{frame} and 66_{glass} (low-e).
      b. Overall U-value Including Glazing: 0.47 Btu/(hr sq ft deg F), maximum.
      c. Condensation Resistance Factor: Measure in accordance with AAMA 1503 with 1 inch insulating glass installed.
   5. Water Leakage: None, when measured in accordance with ASTM E331 at specified pressure differential.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 80 00.

C. High performance extruded aluminum sill receptor flashings as detailed on Drawings, finish to match framing members.

D. Accommodate lintel deflection per details on Drawings.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Exposed Flashings: Aluminum sheet, 18 gage, 0.040 inch minimum thickness; finish to match framing members.
   1. Provide brake-formed or extruded aluminum shapes indicated on drawings.
   2. Provide head receptors as indicated on drawings.

D. Sealant for Setting Thresholds: Non-curing butyl type.

E. Glass: As specified in Section 08 80 00.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

G. Glazing Accessories: As specified in Section 08 80 00.

H. Closed Cell Foam Insulation: Gun-grade, single-component, low-expanding, polyurethane foam joint filler formulated to achieve thermal, sound and air barrier continuity at the perimeter of opening frames in exterior walls.
   1. Manufacturers:
      a. Tremco; ExoAir LEF: www.tremcosealants.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Comply with ASTM E-84:
      a. Flame Spread: 5.
      b. Smoke Development: 30.

I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: As specified in Section 08 71 00.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

2.07 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware and door operators.

G. Reinforce framing members for imposed loads.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Fill shim spaces with non-expanding foam sealant at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 25 11 - Weather Barriers - Fire Retardant Fluid Applied: Sealing frame to weather barrier installed on adjacent construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between window frames and adjacent construction.

C. Section 08 80 00 - Glazing: Glass and Glazing standards.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products 2021.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

J. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors 2002 (Reapproved 2018).

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.

L. ASTM Standard Test Methods

1. ASTM E283, Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
2. ASTM E330, Structural Performance of Exterior Windows, Doors by Uniform Static Air Pressure Difference
3. ASTM E331, Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
4. ASTM E1105, Field Determination of Water Penetration of Installed Exterior Windows, Glazed aluminum facade systems and Doors by Uniform or Cyclic Static Air Pressure Difference.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, descriptions of hardware and accessories, and thermal performance data including system U values, Solar Heat Gain Coefficient, and Condensation Resistance Factor..

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
1. Evidence of AAMA Certification.
2. Evidence of WDMA Certification.
3. Evidence of CSA Certification.
4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

D. Full-Size Mock-up Testing: Have a specimen representative of project conditions tested by an independent testing agency for compliance with specified thermal, structural, air infiltration, water penetration, and sound attenuation criteria.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

1.08 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Windows (window wall): Basis of Design - Kawneer; MetroView FG 601T PG; www.kawneer.us
   1. Acceptable alternate manufacturers subject to compliance with requirements:
      a. EFCO, a Pella Company; 645X: www.efcocorp.com/#sle.

2.02 WINDOWS

A. Performance Requirements: Provide products that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
      a. Performance Class (PC): AW-PG 100 for fixed windows.
   2. Condensation Resistance Factor of Frame: 76, Glass: 74, measured in accordance with AAMA 1503.
   3. Overall U-value, Including Glazing: 0.34 (fixed) maximum, measured on the window size required for this project.
   4. Solar Heat Gain Coefficient: 0.35
   5. Visible Light Transmittance: 0.70
   6. Air Infiltration: Fixed window air infiltration shall not exceed 0.01 cfm/ft2 when tested in accordance with ASTM E 283 with a pressure difference of 6.27 psf / 300 Pa.
   7. Water Penetration Resistance:
      a. There shall be no uncontrolled leakage for fixed windows when tested in accordance with ASTM E547 with a pressure difference of 12 psf / 720 Pa (Laboratory Test, Static).
   8. Uniform Load Deflection Test: The deflection of fixed window shall not exceed L/175 and there shall be no permanent set when tested in accordance with ASTM E330, with a design pressure of 100 psf (fixed) / 4800 Pa (fixed) , positive and negative.

B. Fixed, Non-Operable Type:
   1. Construction: Thermally broken.
   2. Glazing: Double; clear; low-e.
   3. Exterior Finish: Class I natural anodized.
   4. Interior Finish: Class I natural anodized.

2.03 COMPONENTS

A. Frames: Manufacturers standard section as required for the configurations indicated in the drawings (7 inch depth maximum); thermally broken with interior portion of frame insulated from exterior portion;

B. Glazing: As specified in Section 08 80 00.

C. Sills: 0.125 inch thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.

D. Glazing Materials: As specified in Section 08 80 00.

E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

F. Closed Cell Foam Insulation: Gun-grade, single-component, low-expanding, polyurethane foam joint filler formulated to achieve thermal, sound, and air barrier continuity at the perimeter of opening frames in exterior walls:
   1. Manufacturer/Product:Tremco ExoAir LEF.

2.04 MATERIALS

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

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows and doors in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Spray closed cell polyurethane foam insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install glass in accordance with requirements specified in Section 08 80 00.

3.03 TOLERANCES

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

3.04 FIELD QUALITY CONTROL

A. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Perform tests on one individual window of each type in designated locations as indicated on drawings.
2. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
3. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.

B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

3.07 SCHEDULE

A. All windows on the East elevation of Phase 1.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.
   d. Final keying schedule
   e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
   f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) 3 years
        2) Exit Devices
            a) 3 years
        3) Closers
            a) 30 years

4) Automatic Operators
a) 2 years
b. Electrical Warranty
1) Locks
a) 1 year
2) Exit Devices
a) 1 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. Hager
   b. Stanley

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Heavy weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
6. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Pemko
   b. Roton

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. Securitron

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage L9000 series

2. Acceptable Manufacturers and Products:
   a. Sargent 8200

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
   a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
   a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.

b. Lever Design: LON.

2.08 MORTISE LOCKS – NARROW STYLE

A. Manufacturer and Product:

1. Scheduled Manufacturer:
   a. Accurate

2. Acceptable Manufacturers:
   a. Adams Rite

B. Requirements:

1. Provide narrow style mortise locks conforming to ANSI/BHMA A156.13, Grade 1 Operational and manufactured from heavy gauge steel, containing components of steel with zinc dichromate plating for corrosion resistance. Cylinders: Refer to "KEYING" article, herein.
2. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
3. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets.
4. Lever Trim: Matching levers and roses or escutcheons from manufacturer of standard mortise locks. Provide all necessary fasteners, spindles, and parts to make complete functioning unit.
   a. Provide levers that return to within 1/2 inch (13 mm) of door face.

2.09 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage ND series

2. Acceptable Manufacturers and Products:
   a. Sargent 11-Line

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Lever Design: LON.

2.10 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Sargent 19-43-GL-80 Series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.11 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Security Door Controls 55

2. Acceptable Manufacturers:
   a. Von Duprin

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant.
3. Provide electric strikes that are field selectable fail-safe and fail-secure.
4. Provide electric strikes cycle tested to endure a minimum of 250,000 cycles.
5. Where required, provide electric strikes UL Listed for fire doors and frames.
6. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.12 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
   a. Securitron

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

2.13 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage Everest 29 T

2. Acceptable Manufacturers and Products:
   a. Sargent XC series

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
   a. Patented Restricted: cylinder with interchangeable core with patented, restricted keyway.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.14 KEYING

A. Scheduled System:

1. New factory registered system:
   a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
      4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.

5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core.
2) Permanent Control Keys: 3.
3) Master Keys: 6.

2.15 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
a. Telkee

2. Acceptable Manufacturers:
a. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.16 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
a. Sargent 280 Series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.

6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN Senior Swing

2. Acceptable Manufacturers and Products:
   a. Stanley Magic Force

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI/BHMA A156.19.
   a. Opening: Powered by DC motor working through reduction gears.
   b. Closing: Spring force.
   c. Manual, hydraulic, or chain drive closers: Not permitted.
   d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
   e. Cover: Aluminum.

2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 1 to 32 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, and adapters for arms as required to suit details.
4. Provide motion sensors and/or actuator switches, and receivers for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.

2.18 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.20 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.

3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other, and overhead stop cannot be used.

2.21 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. National guard

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. GE

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.23 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)

4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

94258 OPT0329622 Version 5

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	STOREROOM LOCK	L9080L LONA LLL LLL LESS LOCK CASE	626	SCH
1	EA	NARROW STILE MORTISE LOCK BODY (FAIL SECURE ELEC)	STOREROOM 8859EU X RX SWITCH	626	ACC
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	MORTISE CYLINDER	26-094 X CORRECT CAM	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	OH STOP & HOLDER	100H	630	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630 X 4040XP-18TJ	689	LCN
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	NOTE	WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER	UNF	BYO

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 02

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-98-L-NL-LON-CON 24 VDC	626	VON
2	EA	RIM HOUSING	20-079	626	SCH
2	EA	FSIC CORE	23-030 EV29 T	626	SCH
2	EA	FSIC CORE	23-030 ICX	ORG	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
2	SET	MEETING STILE	328AA-S	AA	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
2	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICES ARE TO RETRACT THE LATCHES AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICES.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE QEL LATCH RETRACTION FEATURE AS WELL AS WIRING TO THE QEL LATCH RETRACTION FEATURE ISTELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACTS AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

1 Hardware Group No. 03

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	FIRE EXIT HARDWARE	9847-EO-F	626	VON
1	EA	FIRE EXIT HARDWARE	9875-L-NL-F-LON	626	VON
1	EA	MORTISE CYLINDER	26-094 X CORRECT CAM	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	COORDINATOR	COR X FL (MTG BRACKETS AS REQD)	628	IVE
1	EA	CARRYBAR	CB1	652	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	SET	OVERLAPPING ASTRAGAL	322A-S	A	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	ASTRAGAL	43SP	SP	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER

3

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-L-F-M996-LON-FS	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE M996 ELECTRIFIED LEVER TRIM AS WELL AS WIRING TO THE M996 LEVER TRIM ISTELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-L-F-M996-LON-FS	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE M996 ELECTRIFIED LEVER TRIM AS WELL AS WIRING TO THE M996 LEVER TRIM ISTELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-98-L-M996-LON-FSE	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRFIED LEVER TRIM, THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-LON	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

OPENING TO BE MONITORED ONLY

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

Hardware Group No. 08

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-LON	626	VON
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

OPENING TO BE MONITORED ONLY

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-EO-F	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

OPENING TO BE MONITORED ONLY

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EL STOREROOM LOCK	ND80JDEL LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE ELECTRIFIED LOCK AS WELL AS WIRING TO THE ELECTRIFIED LOCK ITSELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 5 X 4.5	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 13

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 14

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EL STOREROOM LOCK	ND80JDEL LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE ELECTRIFIED LOCK AS WELL AS WIRING TO THE ELECTRIFIED LOCK ITSELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 15

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 16

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 17

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 18

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	PRIVACY W/DB & IND	LV9496J LONA L583-363 XL11-986 RX	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	ELECTRIC STRIKE	55 - D - LBM - DBM	630	SDC
1	EA	SURF. AUTO OPERATOR	9542 MS AS REQ (120/240 VAC)	ANCLR	LCN
2	EA	ACTUATOR, TOUCHLESS	8310-813R	BLK	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE, SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH INSIDE THE ELECTRIC STRIKE AND ENABLE THE PULL SIDE AUTO-OPERATOR HAND-WAVE ACTUATOR ALLOWING MANUAL OR AUTOMATIC INGRESS. IMMEDIATE MANUAL OR AUTOMATIC EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ONCE INSIDE THE RESTROOM THE DEADBOLT MONITOR SWITCH IN THE ELECTRIC STRIKE IS TO DISABLE THE CREDENTIAL READER AND THE AUTO-OPERATOR HAND-WAVE ACTUATOR.

POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE, THE DOOR CONTACT, THE LX MONITOR SWITCH INSIDE THE ELECTRIC STRIKE, THE DEADBOLT MONITOR SWITCH INSIDE THE ELECTRIC STRIKE AND THE RX SWITCH INSIDE THE LOCK.

Hardware Group No. 18A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HANGING DEVICES	WELD-ON PIVOTS BY TGP	AL	TGP
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	DOOR BOTTOM	420APKL	AL	PEM
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 19

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	ND10S LON	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER

Hardware Group No. 20

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5	630	IVE
1	EA	PASSAGE SET	ND10S LON	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER

Hardware Group No. 21

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-L-F-M996-LON-FS	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE M996 ELECTRIFIED LEVER TRIM AS WELL AS WIRING TO THE M996 LEVER TRIM ISTELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 22

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-L-F-M996-LON-FS	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC	LGR	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT OR THE LATCHBOLT MONITOR SWITCH ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

REMOTE UNLOCKING WITHOUT UNLATCHING IS AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE M996 ELECTRIFIED LEVER TRIM AS WELL AS WIRING TO THE M996 LEVER TRIM ISTELF.
3) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE LX AND RX SWITCHES INSIDE THE PANIC HARDWARE.

Hardware Group No. 23

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-LON	626	VON
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

OPENING TO BE MONITORED ONLY

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

1 Hardware Group No. 24

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-LON	626	VON
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

3

Hardware Group No. 24A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	EU STOREROOM LOCK	ND80JDEU LON RX CON 12V/24V DC	626	SCH
1	EA	MONITOR STRIKE	4570-T1 24 VDC	626	VON
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	COORDINATOR	COR X FL (MTG BRACKETS AS REQD)	628	IVE
1	EA	OH STOP	90S	630	GLY
2	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	OVERLAPPING ASTRAGAL	322A-S	A	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	ASTRAGAL	43SP	SP	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
2	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE PUSH SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACTS OR THE LATCHBOLT MONITOR STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACTS, THE LX MONITOR STRIKE AND THE RX SWITCH INSIDE THE ELECTRIFIED LOCK.

Hardware Group No. 25

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80JD LON	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 26

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80JD LON	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 26A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80JD LON	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	FSIC CORE	23-030 ICX	ORG	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 27

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	ND10S LON	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 28

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S LON	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 29

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DOOR CONTACT	674-OH	628	SCE
1	EA	NOTE	ALL OTHER HARDWARE BY DOOR MFG.	UNF	B/O

OPENING TO BE MONITORED ONLY

ITEMS TO BE SUPPLIED BY THE DIVISION 28 SUPPLIER:
1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

Hardware Group No. 30

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA		OPENING ONLY. NO HDW REQD	UNF	MIS

Hardware Group No. 31

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	ALL HARDWARE BY DOOR SUPPLIER	UNF	B/O

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Sectiion 08 41 24-Fire Rated Aluminum Framed Entrances and Storefronts: Fire Rated Glazing as part of that system specified in that section.

E. Section 08 42 29 - Automatic Entrances: Glazing provided as part of door assembly.

F. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

G. Section 08 51 13 - Aluminum Windows: Glazing provided as part of window assembly.

1.03 REFERENCE STANDARDS

A. OSHA 1910.28(b)(3)(i)(A) - Occupational Safety and Health Standards, Duty to Have Fall Protection and Falling Object Protection, Skylight Cover.

B. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials current edition.

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test 2010.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2011).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2014.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2014.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2013.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

J. GANA (GM) - GANA Glazing Manual 2009.

K. GANA (SM) - GANA Sealant Manual 2008.

L. GANA (LGRM) - Laminated Glazing Reference Manual 2009.

M. ICC (IBC) - International Building Code 2015.

N. IGMA TB-3001 - Guidelines for Sloped Glazing 2001.

O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2004).

P. ITS (DIR) - Directory of Listed Products current edition.

Q. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. See Section 01 33 23-Submittals, for submittal procedures.

C. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

D. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

E. Samples: Submit two samples 12 by 12 inch in size of glass units.

F. Certificate: Certify that products of this section meet or exceed specified requirements.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1. An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

D. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

E. Single Source Responsibility: Provide materials obtained from one source for each type of insulating glass and glazing product indicated.

F. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

G. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Insulating Glass Certification Council.

I. Permissible Glass Distortion for Heat Treated and Fully Tempered Glass:

1. Criteria:
   a. Tolerance of 0.005 inches.

1) Tolerance for roller wave is a maximum of 0.003" from peak to valley in the center of lites, a maximum of 0.008" within 10.5" of the leading or trailing edge, and maximum 50% of the bow/warp tolerance in ASTM C 1048.
2) Tolerance for localized warp for rectangular glass is 1/32" over any 12", or half of the ASTM C 1048 Standard Specification for Heat-Treated Flat Glass standard of 1/16" over any 12"span.

b. Orient the heat-treated glass so that the roller wave is parallel to the window sill / header.
c. Heat-treated glass shall be free of visible mosaic or pattern optical distortion (as opposed to slight waviness noticeable when viewpoint is moving).
d. Heat-treated glass shall be free of defects caused by roller pick. This includes a defect which causes straight lines on nearby buildings, viewed through the glass, to be fuzzy or pixilated in appearance.
1) Millidiopter requirement of no more than +/- 100.
e. Bow and warp not to exceed 1/2 ASTM C1048 for overall Bow and Warp Tolerances.

2. Manufacturing and Fabrication:
a. Produce all heat-treated glass for project on the same equipment using the same processing parameters.
b. Adjust the heat zones and time sequences to optimize heat absorption in the glass without over-heating.
c. Various low-E coatings, substrates, and furnace configuration will be treated differently, as required to achieve specified results.
d. Adjust quench air flow to flatten glass and to minimize roll wave, center-kink, leading and trailing edge distortion, etc.
e. Monitor output to assure that glass complies with specification.

3. Mock-up and Documentation:
a. A full size mock-up shall be viewed under actual jobsite conditions to evaluate the appearance.
b. Glass fabricator shall provide production measurements to be submitted for this mockup, so that Architect can compare quantifiable data with qualitative visual review.

1.07 MOCK-UPS

A. See Section 01 43 39-Quality Requirements for additional requirements.

B. Provide mock-up of an aluminum window unit including glass for installation in a mock-up wall.

C. Locate where directed.

D. Mock-ups may not remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 78 36-Warranties, for additional requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

D. Etched (Bird Safe) Glass: Provide a ten (10) year manufacturer warranty of acid etched pattern for surface degredation.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

2.02 INSULATING GLASS UNITS

A. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Warm-Edge Spacers: Low-conductivity thermoplastic with dessicant warm-edge technology design.
      a. Spacer Width: As required for specified insulating glass unit.
      b. Spacer Height: Manufacturer's standard.
      c. Products:
         1) Technoform Glass Insulation; TGI-Spacer: www.glassinsulation.us/#sle.
      d. Spacer Color: Black.
   4. Purge interpane space with argon, hermetically sealed.

2.03 INSULATING GLASS UNIT SCHEDULE

A. **Type IG-1A** - Insulating Glass Units: Low-E, Low-Iron, Vision glass, double glazed, heat Strengthened.
   1. Composition:
      a. Outboard Lite: Heat strengthened float glass, 1/4 inch thick, minimum.
         1) Tint: Low Iron, Vitro Glass Products, Starphire.
         2) Coating: Low-E, Vitro Glass Products, Solarban 72, on #2 surface.
      b. Space between lites filled with argon.
      c. Inboard Lite: Heat Strengthened float glass, 1/4 inch thick, minimum.
         1) Tint: Low Iron, Vitro Glass Products, Starphire.
   2. Total Thickness: 1 inch.
   3. Performance Characteristics:
      a. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.26, nominal.
      b. Visible Light Transmittance (VLT): 71 percent, nominal.
      c. Solar Heat Gain Coefficient (SHGC): 0.30 percent, nominal.

B. **Type IG-1T** - Insulating Glass Units: Low-E, Low-e, Low Iron, Vision glass, double glazed, Fully Tempered.
   1. Same as IG-1A except both inner and outer lights fully tempered in lieu of Heat Strengthened.

C. **Type IG-22T**: 1-inch Insulating Clear Glass, with Acid Etched, Low-E, Fully Tempered, Bird Safe Glass.
   1. Applications: Exterior glazing where indicated.
   2. Composition:
      a. Outboard Lite:
         1) Thickness: 1/4-inch.
         2) Type: Fully Tempered.
         3) Tint: Clear; Acid Etched Markers on Surface #1; Basis of Design: Walker: AVIProteck 213: 3 mm vertical lines spaced 2 inches apart meeting the recognized 2x2 rule.
            (a) Threat Factor of 25 or less.
            (b) Acceptable alternate manufacturers patterns subject to compliance with requirements:
               (1) Etched Pattern: Guardian Bird1st Etch 13 (vertical lines) on #1 surface.
         4) Coating: LowE (solar control type) Solarban 70 on #2 surface.
      b. Space: 1/2” warm air spacer, argon filled.
      c. Inboard Lite: Fully Tempered float glass.

1) Thickness: 1/4-inch.
2) Tint: Clear.

d. Total Thinkness: 1 inch.

3. Performance Charactersitics:
   a. Thermal Transmittance (U-Value), Summer - Center of Glass: .26, nominal.
   b. Visible Light Transmittance (VLT): 64 percent, nominal.
   c. Solar Heat Gain Coefficient (SHGC): .27 nominal.
4. Glazing Method: Dry glazing method, gasket glazing.

2.04 MONOLITHIC GLASS UNIT SCHEDULE

A. **Type S-1A** - Single Vision Glazing:
   1. Type: Annealed float glass.
   2. Tint: Clear.
   3. Thickness: 1/4 inch.

B. **Type S-1T** series - Single Safety Glazing: Non-fire-rated.
   1. Application: Provide this type of glazing in the following locations:
      a. Glazed sidelights to doors, except in fire-rated walls and partitions.
      b. Other locations required by applicable federal, state, and local codes and regulations.
      c. Other locations indicated on the drawings.
   2. Type: Fully tempered float glass as specified.
   3. Tint: Clear.
   4. Thicknesses:
      a. Type S-1Ta: 1/4-inch minimum, or greater as required by span tables.
      b. Type S-1Tb: 1/2-inch minimum, or greater as required by span tables.
      c. Type S-1Tc: 3/4-inch minimum, or greater as required by span tables.

C. **Type S-4F**: Fire-Rated Safety Glazing:
   1. IBC Fire Protection Rating: As indicated on drawings.
   2. Manufacturer: FireLite® Plus as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, Kirkland, Washington, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, web site www.fireglass.com.
      a. Equivalent: Keralite Select L.
   3. Labeling: Permanently label each piece of FireLite with the FireLite® logo, UL logo and fire rating.
   4. Properties:
      a. Weight: 4 lbs./sq. ft.
      b. Type: Glass-ceramic safety glazing.
      c. Thickness: 5/16 inch.
      d. Light Transmittance: 88 percent, nominal.
      e. Approximate Visible Reflection: 9 percent.
      f. Hardness (Vicker's Scale): 700.
      g. Impact Safety Resistance: Category 2.
      h. Positive Pressure Test: UL 10C, UBC 7-2 and 7-4; passes.
      i. Surface Finish: Premium (polished).
   5. Glazing Method: As required for fire rating.

D. **Type S-11F** - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
   1. Applications:
      a. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
      b. Other locations as indicated on drawings.
   2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.

3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 60 minutes., 90 minutes., and 120 minutes.
5. Manufacturers:
    a. Technical Glass Products; Pilkington Pyrostop 60: www.fireglass.com/#sle.

2.05 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-sag, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; Selected color.

2.06 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Accessories for Butt Joint Glazing: Clear anodized aluminum recievers with black glazing gaskets.
1. Basis of Design Manufacturer: C.R. Laurence Co., Inc.
2. Configurations:
    a. Typical bottom receiver: 1-inch wide by 1-inch high.
    b. Typical top receiver: 1-inch wide by 2-inches high.
    c. Other configurations (if detailed on drawings).
3. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; Clear color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; black color.

E. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
1. Width: As required for application.
2. Thickness: As required for application.
3. Manufacturers:
    a. Tremco Global Sealants: www.tremcosealants.com.

F. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

G. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - WET GLAZING METHOD (COMPOUND AND COMPOUND)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

C. Locate and secure glazing pane using glazers' clips.

D. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.06 INSTALLATION - WET/DRY GLAZING METHOD (PREFORMED TAPE AND SEALANT)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

C. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

D. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

E. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

F. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.

1. Place glazing tape on glazing pane of unit with tape flush with sight line.

G. Fill gap between glazing and stop with _____ type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of _____ type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.07 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.09 SCHEDULES

A. Aluminum Entrances: Exterior wet/dry method.

B. Aluminum Storefronts: Exterior dry method (Gasket Glazing).

C. Hollow Steel Frames: Interior wet method.
   1. Glazing Method: As required for fire rating.

D. Steel Doors: Interior wet method.
   1. Glazing Method: As required for fire rating.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to concrete floor substrates identified in Material Schedule on Drawings to receive the following floor finishes:
   1. Resilient tile and sheet.
   2. Thin-set ceramic tile and stone tile.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs:
   1. Verify that substrates are ready for finish flooring installation by testing for 1) Bond Testing 2) Alkalinity and Adhesion 3) Moisture 4) dewpoint temperature and 5) ASTM C856 testing.

D. Remedial floor coating work for concrete substrates when one or more concrete substrate for floor finish required tests do not indicate "passing."

E. Patching compound.

1.02 RELATED REQUIREMENTS

A. Section 01 23 01- Alternates: See Alternate-1, moisture mitigation Work associated with concrete substrates for floor finishes.

B. Section 01 60 00 - Product Requirements.

C. Section 03 30 00 - Cast-in-Place Concrete:
   1. Concrete subfloors must be of adequate tensile strength (minimum 200 psi when tested in accordance with ASTM D4541 Method 5).
   2. New poured concrete flooring substrates shall be wet cured with a moisture-retaining curing cover. Chemical curing compounds reduce the drying rate of concrete and can interfere with the adhesive bond.
   3. If temporary heating causes the slab to cure too rapidly, then it may create a problem with floor adhesion. Follow steps as specified to prevent potential curing that is too rapid.
   4. All newly poured concrete slabs on or below grade shall have a functioning vapor barrier directly under the concrete slab.

D. Coordinate with Division 09 Sections for substrate preparation and installation requirements.
   1. Section 09 65 00 - Resilient Flooring.
   2. Section 09 91 13 - Exterior Painting.
   3. Section 09 91 23 - Interior Painting.

1.03 PRICE AND PAYMENT PROCEDURES

A. Alternates : See Section 01 23 00 - Alternates.
   1. Alternate for Remedial Floor Coating or Sheet Membrane: Do not include the cost of Vapor Control coating in the base bid; state on the bid form the total additional cost for the floor coating, installed, in the event such remediation is required.

1.04 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

D. C2C (DIR) - C2c Certified Products Registry; Cradle to Cradle Products Innovation Institute; http:www.c2ccertified.org/products/registry.

E. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

F. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

G. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

H. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

I. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

J. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.06 SUBMITTALS

A. See Section 01 60 00 - Product Requirements.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
   3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   4. Manufacturer's installation instructions.
   5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

D. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. All test reports as specified within this Section.
      a. *Architect shall not approve any floor material submittals until all (5) types of test results for concrete substrates and conditioned space have been submitted, "passing".*
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.
   7. Include certification of accuracy by authorized official of testing agency.
   8. Submit report to Architect.
   9. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

1.07 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

D. Remedial Coating Installer Qualifications:
1. Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 5 years' experience installing moisture emission coatings.
2. Employ Applicator currently approved by manufacturer, experienced in surface preparation and application of the material and subject to inspection and control of the manufacturer.

E. Install Remedial Coating over properly mechanically prepared concrete surfaces with minimum surface profile of ICRI CSP #3

F. Manufacturer's Qualification
1. Manufacturer shall have no less than 5 years experience in manufacturing vapor control system. The vapor control system shall be specifically formulated and marketed for vapor and alkalinity control without change of formulation or system design for a minimum period of 5 years.
2. Provide standard 10 year warranty at no additional cost. Applicator of vapor control system shall provide standard installation warranty for quality of installation.
3. Provide Independent lab test reports documenting performance per the following:
   a. ASTM E96, Water Vapor Transmission (dry and wet methods) Performance shall be documented by an independent testing laboratory at a minimum of 90 percent water vapor transmission reduction compared to untreated ACI Committee 201 durable concrete.
   b. ASTM D1308: Insensitivity to alkaline environment up to pH 9.
   c. Certify acceptance to continuous topical water exposure after final cure.
4. Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial moisture vapor emission rate (MVER) of 15 lbs. per 1,000 sf per 24 hrs, and have resulted in maintained MVER equal to or less than 3 lbs. per 1,000 sf per 24 hrs when tested to ASTM F1869-98 or an RH value of 95 percent or less when measured per ASTM F2170.

1.08 SCHEDULING

A. Coordinate testing with the Owner and allow enough time to test, submit and install the vapor control system before installation of floor finish.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the job site in their original unopened containers, clearly labeled with manufacturer's name and brand designation.
1. Include installation instructions.

B. See Section 01 60 00 - Product Requirements, Storage and Protection.

C. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light in areas with temperature range between 50 and 90 degrees F.

1.10 FIELD CONDITIONS

A. Observe basic rules for working with epoxy and concrete.

B. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.

C. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

D. Install quickly if substrate and job site conditions are above 70 degrees F.

E. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

F. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Prohibited material content: See Section 01 60 00 - Product Requirements.

B. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

C. Remedial Floor Coating Product:
   1. Provide epoxy-based vapor control system from a single manufacturer:
      a. Koster VAP 1 2000 System by Koster American Corporation; (757) 425-1206.
      b. Ardex Moisture Control system.
      c. Bostik Slab-Cote Extreme Moisture Vapor Barrier Coating
   2. Sand: Fine sand less than 1/50 of an inch in grain size or 98.5 percent passing sieve size #35.
   3. Aggregate: Well graded, washed gravel, 1/8 inch to 1/4 inch or larger.
   4. Water for mixing the cementitious materials shall be clean, potable, and sufficiently cool (not warmer than 70 degrees F).
   5. Mix Designs: Use clean containers and mix thoroughly per Manufacturer's written requirements to obtain a homogeneous mixture.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary Cleaning.
   2. Specified Testing.
   3. Specified remediation, if required.
   4. Patching, smoothing, and leveling, as required.
   5. Other preparation specified.
   6. Adhesive bond and compatibility test.
   7. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the

flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust and other substrate coatings and other substances that contain soap, silicone, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond, using mechanical methods recommended by manufacturer.

B. Do not use solvents or other chemicals for cleaning.

3.03 EXAMINATION OF CONCRETE SUBSTRATES

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Testing: Verify that substrates are ready for resilient flooring installation by testing for 1) Adhesive Bond Testing 2) Alkalinity and Adhesion 3) Moisture 4) dewpoint temperature as well as 5) ASTM C856 testing:

1. Complete Adhesive Bond Testing to determine compatibility of the adhesives to the concrete slab, as required by Flooring and Adhesive Manufacturers as well as referenced standards.
   a. To conduct a bond test, select approximately a 3-foot square sample of the exact floor finish product scheduled, and adhere it to the subfloor with the exact adhesive that will be used during installation.
   b. Conduct one bond test for each finish floor material scheduled. Conduct more if recommended by manufacturer's directions.
   c. After 72-hours attempt to remove the sample. If sufficient force must be used to remove the sample, this test is considered "passed".
2. Alkalinity and Adhesion Testing:
   a. Perform tests recommended by manufacturer.
   b. In addition, test for alkalinity (pH) per ASTM F-710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
      1) Use a wide range alkalinity (pH) test paper. its associated chart, and distilled or deionized water.
      2) Place several drops of water on a clean surface of concrete, forming a puddle approximately 1-inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
      3) Allowable readings for Alkalinity are determined by the flooring and adhesive manufacturers *for each product*.
3. Moisture Testing:
   a. Perform moisture testing as recommended by manufacturer.
   b. In addition, test in accordance with ASTM F-2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
   c. Use procedure A, one test for every 1,000 square feet.
   d. Document specific test locations, quantity, and a table of readings.
   e. Testing documentation shall be provided to Architect prior to flooring installation.
   f. Allowable readings for moisture are determined by the flooring and adhesive manufacturers for each product.
4. Dewpoint Measurements: Conduct the following measurements:
   a. Room relative humidity.
   b. Use a hygrometer to verify that the room air is not too humid for adhesive to set properly. It may be necessary to set up air movement devices, like fans or blowers, or dehumidifiers, to precondition the room and maintain a proper environment throughout the installation process.

c. Use a standard thermometer to measure the air temperature of the room.
d. Use a special thermometer for measuring concrete surface temperature.
e. Verify that the moisture content of the concrete surface is not too high for adhesive to set properly.
f. Dewpoint temperature.

5. Perform one ASTM C856 test per floor.
   a. The location shall be identified by The Architect, once the slabs are complete.
      1) Architect shall select a sensitive location where finishing may appear questionable.

3.04 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound to achieve smooth, flat, hard surface.

D. Do not fill expansion joints, isolation joints, or other moving joints.

E. At transitions to a significantly thicker floor materials such as ceramic tile, install trowelable leveling compound to produce a uniform and smooth slope of a 3/8” rise within a 12” horizontal dimension.

F. Prohibit traffic until filler is cured.

G. Clean substrate.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 PROVISION OF REMEDIAL FLOOR COATING

A. This Work is Associated with an Alternate-1 in the event that one or more of the required tests fail.

B. Comply with requirements and recommendations of coating manufacturer.

C. Clean surfaces to receive moisture vapor reduction system.
   1. Shot blast floors and clean surfaces to remove residue.
      a. Refer to the International Concrete Repair Institute (ICRI), Technical Guideline #03732, "Selecting and Specifying Concrete Surface Preparation for Coatings.
      b. Concrete Surface Profile (CSP) Scale: CSP 3 (light shotblast).
   2. Remove defective materials and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast bee bees, etc.
   3. Repair cracks, expansion joints, control joints, and open surface honeycombs; fill in accordance with Manufacturer's recommendations.
      a. Moving Joints: Honor expansion and isolation joints up through the Vapor Control System, underlayment and topping.
      b. Saw Cuts, Control Joints and Dormant Cracks: Fill non-moving joints and cracks greater than 1/32 inch with manufacturer recommended product. Allow to cure for a minimum of 16 hours prior to proceeding with the installation of Vapor Control System.
   4. Inform vapor reduction system manufacturer if concrete additives like chlorides or other soluble compounds that can contaminate surfaces have been used in the concrete mix.
   5. Burn off reinforcing fibers, scrape and vacuum.
   6. Remove, after shot blasting, leaving no fibers on concrete surfaces.
   7. Provide uncontaminated, absorptive, sound surface.

D. Test substrates for moisture vapor emissions in accordance with ASTM F1869 or ASTM F2170.

E. Moisture Mitigation Manufacturer’s representative must come to the site and for visual inspection and approval of all onsite conditions and all test results.
   1. They shall provide documented acceptance of concrete.

2. Full ten-year warranty of total floor system shall include self-leveling compound, primer, adhesives, and floor finish, etc.

F. Adhesion tests:
1. Verify proper adhesion of flooring adhesives, coatings, and leveling compounds to the final vapor reduction coating system for acceptability. Contact Manufacturer's Representatives for recommendations.

G. Application
1. Mix and apply Vapor Control System in accord with manufacturer's written instructions.
2. For installation of resilient flooring directly over the water vapor reduction system, use 100 percent solids adhesives or contact type adhesives with long working times that can be applied to substrates with a maximum pH of 10. Apply contact type adhesives to substrate and allow water to flash off prior to the flooring installation. Test proper adhesion of adhesive to water vapor reduction system prior to installation of entire flooring systems.

3.07 CLEANING

A. Clean tools and equipment immediately after use per manufacturer's recommendations.

B. Remove debris from project site.

3.08 PROTECTION

A. Protect each coat during specified cure period from traffic, topical water, and contaminants.

END OF SECTION

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SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal channel ceiling framing.

C. Exterior gypsum sheathing board.

D. Exterior soffit board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

C. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 07 21 00 - Thermal Insulation: Z-furring members, insulation, and vapor retarders installed in assemblies that incorporate gypsum board.

E. Section 07 25 11 - Weather Barriers Fire Retardant Fluid Applied: Water-resistive barrier over sheathing.

F. Section 07 53 00 - Elastomeric Membrane Roofing: Roof underlayment or cover boards.

G. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

H. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

I. Section 09 91 23 - Interior Painting

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2015.

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2014.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2012.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2015.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2013.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2015.

H. 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.

I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.

J. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board 2013.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

L. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels 2015.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2013.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2012.

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009.

Q. ASTM E413 - Classification for Rating Sound Insulation 2010.

R. C2C (DIR) - C2c Certified Products Registry; Cradle to Cradle Products Innovation Institute; http:www.c2ccertified.org/products/registry.

S. GA-216 - Application and Finishing of Gypsum Board 2013.

T. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association 2008.

U. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

V. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

W. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

X. ICC (IBC) - International Building Code 2015.

Y. UL (FRD) - Fire Resistance Directory current edition.

Z. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

AA. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. See Section 01 60 00 - Product Requirements.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum three years of experience.

B. Recycled content:
   1. Paper: 100% post-consumer recycled content
   2. Gypsum: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Prohibited material content: See Section 01 60 00 - Product Requirements.

B. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
   4. CEMCO[<>]: www.cemcosteel.com/#sle.

B. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

C. Non-Loadbearing Framing System Components: ASTM C645; (G60 Coating) galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
      a. Minimum Base Metal Thickness: 25 gauge, except at the following conditions that include, but are not limited to:
         1) Where partition height requires heavier section, to accommodate span within L:240 deflection at load of 5 PSF, use heavier stud.
         2) For walls scheduled for ceramic tile: Utilize L/360 deflection at load of 5 PSF.
         3) For walls subject to intermittent exposure to exterior wind conditions such as vestibules, delivery, garages, lobbies: Utilize L/240 deflection at load of 15 PSF.
         4) At jamb openings provide (2) 20 gauge studs, minimum.
         5) At cement backer board, provide 20 gauge studs, minimum.
         6) At lead-lined drywall, provide 20 gauge studs, minimum.
         7) Where abuse resistant wallboard is indicated, provide minimum 20 gauge studs at maximum 16 inch on center.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.0179 inch.

E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

F. Suspension System Components
   1. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of diameter wire.
   2. Hanger Attachments to Concrete:
      a. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      b. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
   3. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
      a. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
      b. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
   4. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
      a. Depth: 2".
   5. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

a. Products: Subject to compliance with requirements, provide one of the following:
   1) Armstrong World Industries, Inc.; Drywall Grid Systems.
   2) Chicago Metallic Corporation; Drywall Furring System.
   3) USG Corporation; Drywall Suspension System.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness: As indicated on wall assembly details in drawings, or as required in tested assemblies referenced, whichever is thickest.
      a. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   5. Fire Resistant Products:
      a. CertainTeed Corporation; ProRoc Type X.
      b. Georgia-Pacific Gypsum; Fireguard.
      c. National Gypsum Company; Fire-Shield.
      d. USG Corporation; Firecode.
   6. Mold Resistant Paper Faced Products:
      a. CertainTeed Corporation; ProRoc Moisture and Mold Resistant.
      b. Georgia-Pacific Gypsum; ToughRock Mold-Guard: www.gpgypsum.com/#sle.
      c. National Gypsum Company; Gold Bond XP.
      d. USG Corporation; Sheetrock Brand Mold Tough.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 1/2 inch unless otherwise indicated.
   3. Edges: Tapered.
   4. Per ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
   5. Products:
      a. CertainTeed Corporation; ProRoc Interior Ceiling Board.
      b. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com/#sle.
      c. National Gypsum Company; High Strength Brand Ceiling Board.
      d. USG Corporation; Sheetrock Brand Sag-Resistant Interior Gypsum Ceiling Board.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing. Interior Gypsum Board installation is prohibited prior to the building being weather-tight. Where the construction schedule demands the construction of interior fire-rated assemblies prior to the building being weather tight, the exterior sheathing specified in this Section should be used in place of interior gypsum wall board.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. Type X Thickness: 5/8 inch.
5. Edges: Square.
6. Glass Mat Faced Products:
   a. CertainTeed Corporation; GlasRoc Sheathing.
   b. Georgia-Pacific Gypsum; DensGlass Gold.
   c. National Gypsum Company; eXP.
   d. USG Corporation; Securock Glass-Mat Sheathing.

E. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Type X Thickness: 5/8 inch.
3. Edges: Tapered.
4. Products:
   a. CertainTeed Corporation; Exterior Soffit Board.
   b. Georgia-Pacific Gypsum; ToughRock Fireguard C Soffit Board: www.gpgypsum.com/#sle.
   c. National Gypsum Company; Gold Bond Exterior Soffit Board.
   d. USG Corporation; Sheetrock Exterior Gypsum Ceiling Board.

2.04 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized steel sheet for general use and rolled zinc for wet areas.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   e. Expansion (control) joint: V-shaped; exposed long flange receives joint compound.

B. Aluminum Trim: Extruded accessories of profiles and dimensions as indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fry Reglet Architectural Metals: fryreglet.com.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
   a. Finish: Class II clear anodic finish.
3. See Drawings for dimensions and profiles of aluminum trim (Fry Regel Corp. Product Numbers):
   a. http://fryreglet.com/downloads_shapefinder/RevealBaseMolding.pdf

2.05 ACCESSORIES

A. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Ready-mixed vinyl-based joint compound.

C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

E. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.06 SHEATHING ACCESSORIES

A. Fasteners: Steel drill screws, ASTM C 954, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.07 AUXILIARY MATERIALS FOR MOISTURE-AND MOLD-RESISTANT GYPSUM BOARD

A. Achieve high-quality finishing results by using the following products recommended by the manufacturer of the mold-resistant gypsum board:
   1. Sheetrock ready mixed joint compounds.
   2. Sheetrock setting-type joint compounds.
   3. Sheetrock joint tape.
   4. Sheetrock first coat primer.
   5. Sheetrock paper-faced metal bead and trim.
   6. Sheetrock Tuff-Hide primer surfacer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Do not attach hangers to steel roof deck.
   3. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   4. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
   6. For suspended fire rated assemblies, comply with suspension system and securement details of referenced UL rated assemblies.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant.
   2. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.
   3. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Rated Construction:
   1. Install gypsum board in strict compliance with requirements of assembly listing.
   2. Even at non-exposed wall surfaces, apply joint compound in two coats to joints and screw heads as required per UL-assembly.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

D. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.
   3. Install control joints according to the most restrictive requirements of the following reference standards:
      a. ASTM C 840, The Standard Specification for Application and Finishing of Gypsum Board.
      b. GA-216, the Gypsum Association Recommended Specification for Application and Finishing of Gypsum Board.
      c. At least two weeks prior to installation of gypsum board, at a regularly scheduled Contractor/Architect meeting, Obtain from the Architect guidelines for the design intent of specific control joint locations for visual effect. This is in addition to the following minimum requirements:
         1) Control joints are recommended at door jambs, extending from door head to ceiling.
         2) Include breaking the gypsum board behind the control joint.
         3) Separate framing members should be used on each side of the control joint.
         4) Install a control joint where ever dissimilar construction meets.
         5) Install a control joint to separate the wings of “L”, and “T” shaped ceiling areas.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, on backing board to receive tile finish, ceiling plenum areas, concealed areas, including fire-resistance-rated assemblies and sound-rated assemblies. Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated
   4. Level 1: Walls and first layers of multi-layer gypsum board applications concealed from view.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

C. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2014.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2014.

E. C2C (DIR) - C2c Certified Products Registry; Cradle to Cradle Products Innovation Institute; http:www.c2ccertified.org/products/registry.

F. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

G. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

H. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

I. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

J. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

K. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2015.

L. UL (FRD) - Fire Resistance Directory current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. See Section 01 60 00 - Product Requirements.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: 1 box of each type and size.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers: See Material Schedule on Drawings.
   1. Substitutions: See Section 01 6000 - Product Requirements.

B. Prohibited material content: See Section 01 60 00 - Product Requirements.

C. Acoustical Units - General: ASTM E1264, Class A.

D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Same as for acoustical units (except .
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

D. Suspension system shall typically be prefinished steel, except use aluminum for areas scheduled:
   1. Suspension System:
      a. Dropped Ceiling Track: 15/16".
      b. Main beams: Double-web construction, web height 1 1/2" with rectangular top bulb and 15/16" flange; two fire expansion reliefs.
      c. Cross tees: Double-web construction, web height 1 1/2" with rectangular top bulb and 15/16" flange with cap and override at each end. Stab-type end detail allows cross tee removal without tools.

E. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

F. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.

D. Where detailed on drawings to provide a transition between ceilings suspended at different heights, provide ceiling grid manufacturer's deep "Trim Channel" with factory miter at bends. Depths as required to accommodate ceiling height steps. Prefinish to match ceiling grid.

E. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
   1. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
   2. USG Corporation; SHEETROCK Acoustical Sealant.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

H. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 23 01 - Alternates: See Alternate-1, moisture mitigation Work associated with concrete substrates for floor finishes.

B. Section 01 60 00 - Product Requirements.

C. Section 09 05 61 - Common Work Results for Flooring Preparation:
   1. Preparation of new concrete floor slabs for installation of floor coverings.
   2. Testing of concrete floor slabs:
      a. Verify that substrates are ready for finish flooring installation by testing for 1) Bond Testing 2) Alkalinity and Adhesion 3) Moisture 4) dewpoint temperature and 5) ASTM C856 testing.
   3. Remedial work for concrete substrates when one or more concrete substrate for floor finish required tests do not indicate "passing."

D. Section 03 30 00 - Cast-in-Place Concrete:
   1. Concrete subfloors must be of adequate tensile strength (minimum 200 psi when tested in accordance with ASTM D4541 Method 5).
   2. New poured concrete flooring substrates shall be wet cured with a moisture-retaining curing cover. Chemical curing compounds reduce the drying rate of concrete and can interfere with the adhesive bond.
   3. Specified steps shall be followed to avoid (temporary heating from causing the slab to cure too fast and creating a problem with floor adhesion.)
   4. All newly poured concrete slabs on or below grade shall have a functioning vapor barrier directly under the concrete slab.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2014c.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2011.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2014).

D. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing 2004 (Reapproved 2014).

E. ASTM F1344 - Standard Specification for Rubber Floor Tile 2015.

F. ASTM F1700 - Standard Specification for Solid Vinyl Tile 2013a.

G. ASTM F1861 - Standard Specification for Resilient Wall Base 2008 (Reapproved 2012).

H. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing 2004 (Reapproved 2014).

I. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering 2008 (Reapproved 2013).

J. ASTM F2169 - Standard Specification for Resilient Stair Treads 2015.

K. ASTM F2195 - Standard Specification for Linoleum Floor Tile 2013.

L. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

M. C2C (DIR) - C2c Certified Products Registry; Cradle to Cradle Products Innovation Institute; http:www.c2ccertified.org/products/registry.

N. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.

O. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

P. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

Q. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

R. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

S. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

T. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2015.

1.04 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
   1. Architect shall not approve any floor material submittals until all (5) types of test results for concrete substrates and conditioned space have been submitted, “passing”.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
   1. For linoleum flooring, report rapidly-renewable content and urea-formaldehyde content.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 full boxes of each type and color.
   3. Extra Wall Base: 10 linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. See Material Schedule on Drawings.

2.02 RESILIENT BASE

A. Resilient Base: See Material Schedule on Drawings.
   1. Height: As indicated on drawings.
   2. Thickness: Manufacturer's standard for the style and type scheduled.
   3. Finish: Manufacturer's standard for the style and type scheduled.
   4. Color: To be selected by Architect from manufacturer's full range.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Same material as flooring.

D. Filler for Coved Base: Plastic.

2.04 UNDERLAYMENT:

A. See Drawings for areas where underlayment is required.

B. Provide product approved by manufacturer of finish flooring.

C. Basis of Design:
   1. Manufacturer: Mapei.
   2. Product: Ultraplan M20 Plus.
   3. Description:
      a. Quick-setting, High-compressive strength Underlayment.
      b. High-hydrated cement technology, calcium-aluminate-based, quick-setting, self-leveling, self-drying material.
   4. Installation:
      a. Preparation: shot blast per ICRI CSP 3.
      b. Primer: After surface preparation, install Mapei 100%-solids epoxy primer using sand broadcast method for self-leveling materials.
      c. Install over 50 degrees F.
      d. Honor joints of substrate.
      e. Do not use a damp curing method or a cure/seal compound.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. See Section 09 05 61 - Common Work Results for Flooring Examination Preparation Work of that Section.

B. Proceed with installation only after substrates pass testing.

1. Do not install adhesives or floor coverings when either the air temperature or the concrete surface temperature is within 5 degrees F. above dewpoint temperature.
2. Do not install flooring over concrete until it has cured, is sufficiently dry to bond well with the adhesive, and the concrete has a pH range recommended by flooring manufacturer.
3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

D. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
1. Resilient Strips: Attach to substrate using adhesive.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.03 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. See Drawings for installation pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.04 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 36 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
1. No traffic for 24 hours after installation.
2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

3. Wait 72 hours after installation before performing initial cleaning

D. A regular maintenance program must be started after the initial cleaning.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
6. Floors, unless specifically indicated.
7. Ceramic and other types of tiles.
8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
9. Glass.
10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete. Prep for concrete to receive paint.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).

B. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

C. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

D. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

E. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

F. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

H. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

I. SSPC-SP 2 - Hand Tool Cleaning 2018.

J. SSPC-SP 6 - Commercial Blast Cleaning 2007.

K. SSPC-SP 13 - Surface Preparation of Concrete 2018.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.05 MOCK-UP

A. See Section 01 43 39-Mock-ups, for general requirements for mock-up.

B. Provide standalone concrete mock-ups for both vertical and horizontal conditions to receive paint finish. Mock-ups to be of size agreed to by the architect and owner to adequately convey variations that the painting contractor may experience in the field. Mock-ups are intended to be constructed in such a way to review the various stages/phases that concrete surfaces will undergo during the course of construction including the following:
   1. Concrete formwork removal.
   2. Concrete rubbing, patching and filling as indicated in 03 30 00 - Cast-in-Place Concrete
   3. Concrete block filler installation.
   4. Paint topcoat installation showing specified color, finish and texture.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

B. Paints:
   1. Base Manufacturer: Sherwin Williams.
   2. PPG Paints: www.ppgpaints.com/#sle.
   3. Hallman Lindsay Paints.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Prohibited material content: See Section 01 60 00 - Product Requirements.

B. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

C. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated:
   1. Exposed Galvanized Steel Metal Fabrications.
      a. Primers and finish paint coats to be applied over galvanized steel substrates as indicated in See 05 50 00 - Metal Fabrications for duplex system prep requirements.
      b. Primers and finish paint coats for metal fabrications to be applied in a conditioned environment (shop finished).
      c. Epoxy System (Water Based): Semi-Gloss Finish.
         1) First Coat: Sherwin-William DTM Acrylic Primer, B66W1 (1.2 mils dry).
         2) Second and Third Coats: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46 series, <150 g/L VOC.
   2. Exposed Concrete and Masonry Walls: Two finish coats over one coat block filler.
      a. Application: As indicated in Drawings.
      b. Latex block filler: High performance, applied at a spreading rate recommended by manufacturer to achieve a total dry mil thickness of not less than 8.0 mils.
         1) Sherwin-Williams; Pro Industrial Heavy-Duty Block Filler, B42W00150.
      c. Second and Third Coats: Latex Enamel, applied at a spreading rate recommended by manufacturer to chieve a total dry mill thickness of not less than 2.3 mils.
         1) Sherwin Williams; SuperPaint Exterior Latex Satin Paint. Satin; MPI 4 gloss level.
   3. Hollow Metal Doors and Frames: Includes hollow metal doors and frames exposed to the exterior environment and the parking structure.
      a. Base Bid - Alkyd (Water-Based Urethane) System:
         1) First Coat: Sherwin Williams Pro Industrial Pro-Cryl Universal primer, B666-1310 Series (5.0 mils wet, 2.0 mils dry).
         2) Second and Third Coat: Sherwin Williams Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss. (1.4-1.7 mils dry per coat)
   4. Steel Pans, Steel Stringers and Railings in Stairs exposed to parking structure.
      a. Epoxy Urethane System: Solid Color Semi Gloss Finish.
         1) First Coat: Sherwin Williams Macropoxy 646 Fast Cure Epoxy, B58-600 Seris (7.0-13.5 mils wet, 5.0-10.0 mils dry).
         2) Second and Third Coat: Sherwin Williams 218 HS Acrylic Polyurethane (4.5-9.0 mils wet, 3.0-6.0 mils dry).

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.
3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

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SECTION 09 91 20
PAVEMENT MARKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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 and/or at streets and sidewalks within the project limits or constructed as part of this project, paint curb ramps (including flares), curb returns at curb ramps and any projecting elements at edges of accessible ramps without handrails. Paint curb returns at driveways and paint curb minimum of 3 ft either side of curb ramp or driveway, (or curb ramp flare length, whichever is greater) in accordance with Pavement Marking.
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.

1.03 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. Resubmittals: Engineer will review each of Contractor’s submittals the initial time and, should resubmittal be required, one additional time to verify that 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 services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

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

E. Engineer reserves the right to reject, unprocessed, any Request for Information (RFI) that the Engineer, at its sole discretion, deems frivolous.

F. Engineer reserves the right to reject, unprocessed, any RFI that the Engineer, at its sole discretion, deems already answered in the Contract Documents.

G. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

1.04 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.

1.05 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

2.01 MATERIALS

A. Pavement marking materials shall meet Federal, State and Local environmental standards.

B. All paints shall be manufactured, formulated and designed for use a pavement and/or traffic marking.

C. 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.

D. Paints shall comply with the National Organic Compound Emission Standards for Architectural Coatings, Environmental Protection Agency, 40 CFR Part 59.

E. The product shall not contain mercury, lead, hexavalent chromium, or halogenated solvents.

2.02 PAVEMENT MARKING PAINTS:

A. Epoxy paint may be used for all markings, unless noted otherwise on the Drawings. Paint shall be a two-component system consisting of minimum 99 percent solids. The material shall be

specifically formulated as a pavement marking material and shall be spray applied at ambient temperatures.

1. The specific paint formulation shall be approved for use on highways by the state and/or local DOT where the project is located.

B. Solvent based paint may be employed for white and yellow pavement markings and shall meet the requirements of MPI #32 or Federal Specification TT-P-115F.

1. Acceptable Projects:

a. Setfast Premium Alkyd Zone Marking Paint by Sherwin Williams

b. Promar Acrylic Copolymer Traffic Paint by Sherwin Williams

c. Setfast Acrylic Traffic Marking Paint by Sherwin Williams

d. Setfast Chlorinated Rubber Zone Marking by Sherwin Williams

e. Zone Line Alkyd Resin 11-3 and 11-10 Series by Pittsburgh Paint

f. EF Series High VOC Alkyd Traffic Paint by Ennis Flint.

2.03 COLOR OF PAINT

A. Color of paint unless noted otherwise on Contract Drawings, shall be yellow and shall match federal color chip No. 33538. The Light Reflectance Value (without glass beads) shall not be less than 45%.

B. Paint color for blue accessible parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 35180. The Light Reflectance Value (without glass beads) shall not be less than 10%.

2.04 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

3.01 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.

3.02 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.

3.03 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 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 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

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and stains.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.
7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
10. Glass.
11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 05 51 00 - Metal Stairs: Shop-primed items.

C. Section 09 21 16 - Gypsum Board Assemblies

D. Section 09 91 13 - Exterior Painting. Concrete mock-ups and paint specifications. Masonry paint specifications.

1.03 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

B. C2C (DIR) - C2c Certified Products Registry; Cradle to Cradle Products Innovation Institute; http:www.c2ccertified.org/products/registry.

C. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

D. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

E. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.

F. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

G. ISO 14044 - Environmental management -- Life cycle assessment - Requirements and guidelines; 2006.

H. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

I. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

J. SSPC-SP 2 - Hand Tool Cleaning 2018.

K. SSPC-SP 6 - Commercial Blast Cleaning 2007.

L. SSPC-SP 13 - Surface Preparation of Concrete 2018.

1.04 SUBMITTALS

A. See Section 01 33 23-ASubmittals, for submittal procedures.

B. See Section 01 60 00 - Product Requirements, Storage and Protection.

C. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

D. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. See Section 01 60 00 - Product Requirements, Storage and Protection.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin Williams.

2. PPG Paints: www.ppgpaints.com.
3. Hallman Lindsay Paints.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Prohibited material content: See Section 01 60 00 - Product Requirements.

B. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Colors: As indicated in Architect's Material Schedule.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated.
1. Hollow Metal Doors and Frames, Steel Railings: All doors and frames, railings and barrier gates to be painted not already specified in Section 09 2113 Exterior Paint.
   a. Alkyd System (Water-Based Urethane): Semi-Gloss Finish.
      1) First Coat: Pro Industrial ProCryl Universal Primer, B66-1310 Series.
      2) Second Coat: Pro Industrial Water Based Alky Urethane Enamel Semi-Gloss, B53-1150 Series.
      3) Third Coat: Pro Industrial Water Based Alkyd Urethane enamel Semi-Gloss, B53-1150 Series.
2. Steel Stringers, Stair Pans and Railings: All steel stringers, stair pans and railings to be painted not already specified in Section 09 21 21 13 Exterior Paint.
   a. Alkyd System (Water-Based Urethane): Semi-Gloss Finish:
      1) First Coat: Pro Industrial ProCryl Universal Primer, B66-1310 Series.
      2) Second and Third Coat: Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3. Fire-Retardant Treated Plywood: Provide paint to all sides of panel prior to installation.
   a. Latex System: Eg-Shel Finish:
      1) First Coat: Premium Wall & Wood Primer, B28W8111 Series.
      2) Second Coat: ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
      3) Third Coat: ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
   3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

F. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.
   3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.

G. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

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SECTION 09 97 25
MINERAL-BASED COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mineral-based coatings.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Section 09 91 13 - Exterior Painting.

C. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. See Section 01 60 00 - Product Requirements.

C. Product Data: Provide data indicating coating materials.

D. Samples: Submit two samples 3 by 6 inch in size illustrating colors for selection.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 MOCK-UP

A. Provide mock-up, 8 feet long by 9 feet illustrating color, texture, and quality of work .

B. See Section 01 43 39-Mock-ups, for additional requirements.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install materials when temperature is below 41 degrees F or above 113 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 48 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.07 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mineral-Based Coatings: See Material Schedule on drawings.

1. Substitutions: See Section 01 25 13-Product Substitution Procedures.

2.02 MATERIALS

A. Prohibited material content: See Section 01 60 00 - Product Requirements.

B. General:

1. Provide mineral-based coatings formulated to chemically bond with the substrate to produce a water-repellent, vapor permeable, fire retardant finish.

C. Stain: Sol-slicate based stain with mineral pigments and fillers.

1. Color: As indicated on drawings.

D. Primer/Thinner: Sol-silicate based primer and thinner. Use as recommended by coating manufacturer to condition unevenly or highly absorbent surfaces, or as a thinner for Sol-silicate coatings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 4 percent.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Protect adjacent surfaces and materials not receiving coating from splatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions.

3.05 CLEANING

A. Clean surfaces immediately of overspray, splatter, and excess material.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for signs.

B. Room and door signs.

C. Interior directional and informational signs.

D. Emergency evacuation maps.

E. Building identification signs.

1.02 RELATED REQUIREMENTS

A. Section 05 51 00 - Metal Stairs: Photoluminescent stair nosings and handrail strips, handrail stiprs, and pathway markings.

B. Section 10 14 01 - Parking Signage: Signage in parking structure

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - Allowances, for cash allowances affecting this section.

B. Allowance amount covers purchase and delivery but not installation.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

D. NFPA 170 - Standard for Fire Safety and Emergency Symbols 2021.

E. UL 1994 - Luminous Egress Path Marking Systems Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

E. Verification Samples: Submit samples showing colors specified.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
1. Best Sign Systems, Inc: www.bestsigns.com/#sl.
2. Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com.
3. Cosco Industries (non-ADA signs); Changeable Message Signs : www.coscoarchitecturalsigns.com.
4. FASTSIGNS: www.fastsigns.com.
5. Inpro: www.inprocorp.com.
6. Mohawk Sign Systems, Inc: www.mohawksign.com.

B. Dimensional Letter Signs:
1. Cosco Industries: www.coscoarchitecturalsigns.com.
2. FASTSIGNS: www.fastsigns.com.
3. Inpro: www.inprocorp.com.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
1. Sign Type: Flat signs with engraved panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
3. Character Height: 1 inch.
4. Sign Height: 2 inches, unless otherwise indicated.
5. Other Common Area Rooms: Identify with the room names and numbers indicated on drawings or as selected by owner.
6. Service Rooms: Identify with the room names and numbers indicated on drawings or as selected by owner.
7. Rest Rooms (common area): Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Accessible Parking Signs:
1. Quantity: One for each accessible parking stall located within interior parking garage.

D. Interior Directional and Informational Signs:
1. Sign Type: Same as room and door signs.
   a. Two-Way Communication Signage.
      1) At each elevator lobby landing.
      2) Identify with directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system and written identification of the location.
      3) Sigange to comply with the ICC A117.1 requirements for visual characters.
   b. Egress Elevators.
      1) At each elevator lobby on each floor serving egress elevators.
      2) Provide accessible means of egress sign with international symbol for accessibility.
   c. Exit Stair Access Signage.
      1) At each elevator lobby landing except for first floor.
      2) Identify with pictogram, text reading IN CASE OF FIRE USE STAIRS, and braille.
      3) Signage to comply with the ICC A117.1 requirements for visual characters.
   d. Floor Level Stair Identification:

1) Provide stair indentification signage in accordance with the 2009 International Fire Code and city of Madison Fire Department requirements.
   (a) Sign Size: 17 inches x 11 inches
   (b) Floor Level Character Height: Minimum 3-1/2 inches
   (c) Identify terminus of the top and bottom levels served by the stair.
   (d) Stairway Identification: Minimum 1 inch character height, indentifying the stair number.
   (e) Signage text to Identify the story of, and direction to the exit dischage.
   (f) Signage text to identify "Roof Access" or "No Rooof Access" as applicable for each stair.
   (g) Location: 5'-0" above the floor level landing and visible regardless of door open position.
2) Locate at the main landings at each level of each exit stair on both sides of each stair door.
3) Identify with numbers or letters and braille

e. Fire Service Access:
1) To be provided at the main landings at each level on the stair side of each stair door that leads to a fire service access elevator lobby.

2. Directional Sign Type: Flat signs with engraved panel media in locations specified by owner.
   a. Allow for 30 signs, 4 inches high by 16 inches long.
   b. Wording and locatiopn of signs to be selected by owner.
3. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.

E. Emergency Evacuation Maps.
1. Allow for one map per elevator lobby.
2. Map content to be provided by Owner.
3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

F. Building Identification Signs:
1. Use individual metal letters.
2. Mount on outside wall and canopy in location indicated on drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media in aluminum frame.
1. Corners: Square.
2. Frame Finish: Natural (clear) anodized.
3. Wall Mounting of One-Sided Signs: Concealed screws.
4. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
5. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: To be selected from manufacturer's standard.
4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
1. Total Thickness: 1/16 inch.

2.05 NON-TACTILE SIGNAGE MEDIA

A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
   1. Total Thickness: 1/8 inch.

2.06 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum casting.
   2. Metal Thickness: Manufacturer's standard for letter size.
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
   5. Finish: As selected by Architect from manufacturer's full range.

2.07 PHOTOLUMINESCENT MEDIA

A. Stair Identification Signs for stairs 2 and 5: Nonflexible photoluminescent sign with tactile raised numbers and Braille markings.
   1. Complies with UL 1994 and ASTM E2072.
   2. Size: 12 inches by 18 inches.
   3. Mounting: As recommended by manufacturer for material selected.
   4. Products:
      a. Safe-T-Nose, LLC; Photoluminescent Stair Identification Sign (ISID): www.safetnose.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Directional Signs: Acrylic photoluminescent square.
   1. Complies with NFPA 170, UL 1994, and ASTM E2072.
   2. Symbol: Running man right.
   3. Size: 5 inches by 5 inches.
   4. Mounting: Peel-and-stick.
   5. Products:
      a. Safe-T-Nose, LLC; Photoluminescent Directional Sign (DRMR): www.safetnose.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 14 01
PARKING SIGNAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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. PVC Pipe Clearance Signs (PVC- Signs).

B. Related Sections include following:

1. Division 09 Sections “Exterior Painting” or “Interior Painting” for painting by others of surfaces to which signs specified herein may be applied. Painting of signs is included in this Section.

1.03 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.

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.
2. Dimensional characters and castings: Full size sample showing character, material, texture, finish, color, style and attachment method.

E. Maintenance Data: For signage cleaning and maintenance requirements to be included in maintenance manual.

F. See requirements of Division 01 Section “Submittals” for limits to re-submittals.

G. See requirements of Division 01 Section “Submittals” for RFI procedures.

1.04 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. Qualifications: Bidder/Installers: When proposed bidder/installer is not proposed manufacturer of at least 75% of signs on project, Bidder/Installer shall be pre-approved. Three weeks before bidding, prospective bidders shall submit to Engineer/Architect 2 copies of portfolio containing 3 representative projects successfully completed over 3 years preceding Bid. One of 3 projects shall be prospective bidder's most recently completed project. Portfolio shall contain plans, shop drawings, reference letters, material samples, and color photographs of representative projects. Engineer/Architect will review all submitted portfolios with Owner and will issue list of acceptable sign subcontractors 1 week before Bid date. Qualification for Project will prequalify Bidder for future projects with Engineer/Architect for 1 year from Project Bid date.

C. Where warranties are required, manufacturer and/or installers shall be authorized by the entity providing the warranty.

D. 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.

E. 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 7-10’s requirements for wind loads.

F. Regulatory Requirements:

1. MUTCD:

a. Regulatory R- and Warning W- 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.

G. 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.

H. 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.

I. 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.

J. Trade Names: Do not display manufacturer’s name, trade name, trademarks, or similar markings on exterior or visible surfaces.

K. 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.

L. 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.

M. 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.

N. 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.

1.05 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.

1.06 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.

1.07 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

2.01 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- and R- signs:
   a. APCO Graphics, Inc.
   b. Architectural Graphics, Inc.
   c. ASI Sign Systems, Inc.
   d. Interstate Highway Sign Corp.
   e. Henry Graphics.
   f. Britten Studios.
   g. Pannier Graphics.
   h. Tapco.
   i. Vomar.
   j. Signs + Decal Corp., Brooklyn, NY
   k. Takeform, Medina, NY
   l. Design Communications Ltd. (DCL).

2.02 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. Content and Style: Provide sign copy that complies with requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices. Notations contained within the comments section of the sign schedule indicate additional text required on sign such as street name, etc. Notations contained within parenthesis ( ) in the sign schedule and instructions for logos or symbols that are to be included on the sign, as shown on the design drawings. Refer to the sign schedule for copy, description of signs, and reference to sign types.
3. 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.

4. 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.

5. Where specified, dry film transfer shall be produced digitally using computer-driven Dry Thermal Transfer system over 3M high intensity reflective vinyl substrates.

6. 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. Painted graphics on steel doors: Refer to Painting specification section. Ferrous metal paint selection for door base. Graphics paint to be compatible with base paint.

c. High gloss enamel base: Graphics medium to be determined by installer and approved by Architect/Engineer. Primer may be required.

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. Fiberglass reinforced plastic (FRP) panels.

a. Panels shall be manufactured of clear resin or UV stabilized, acrylic-modified polyester resin reinforced with high solubility, chopped strand fiberglass mat. Glass fibers shall not be readily discernable on sign face. In addition, sign shall have a glass content of no less than 28% of total sign weight. FRP panels which outgas and cause bubbling of sheeting will not be accepted. Sign shall meet following:

1) Ambient temperature range of –50° F to +300° F.

2) Minimum Barcol hardness of 50, tensile strength of 12,000 psi, compressive strength of 20000 psi and flexural strength of 18000 psi.

3) Minimum impact strength of 6 ft lbs/in notch with fire resistance of 500 degree F.

3. 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.

4. ACM (Aluminum Composite Material)

a. Provide aluminum composite material panels, one or both sides platinum white stove-lacquered or one side metallic-aluminum, reverse mill finish.

1) Outer layers are aluminum; inner core is polyethylene.

b. Provide sign panels with overall thickness in accordance with the following minimums:

1) Wall or Column surface mounted signs: 3mm (0.12”).

2) Overhead signs less than 5’-0” long: 4mm (0.15”).

3) Overhead signs greater than 5’-0” long: 6mm (0.23”).

c. Product shall be compatible with temperature ranges varying from -50°C to +80°C.

d. Product shall have a minimum modulus of elasticity of 70,000 N/mm^2.

e. Product shall have water absorption in % according to Din 53 495-0, 01.

f. Product shall have linear thermal expansion dimensional change of 2.4 mm/m at 100k temperature difference.

D. V- Signs: Vehicular signs with retroreflective graphics and retroreflective message on an opaque background.

1. Base materials:

a. Aluminum with either reverse silk screened graphics or pressure-applied retroreflective letters.

b. ACP with either reverse silk screened graphics or pressure applied retroreflective letters.

c. FRP, but only with painted background and 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. 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 80 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.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 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.

3.04 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 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Public-use bathroom accessories.
   1. Application: Public and private office restrooms.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

D. Utility room accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

D. ASTM C1036 - Standard Specification for Flat Glass 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2004, with Editorial Revision (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 33 23 - Submittals, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Public-use bathroom accessories:
   1. Basis of Design: Bradley Corporation[<>]: www.bradleycorp.com.
   2. Other acceptable manufacturers:
      a. AJW Architectural Products; _____: www.ajw.com/#sle.
      b. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   3. Substitutions: Section 01 63 11 - Product Substitutions.
   4. Basis of Design Product Selections: See drawings for locations.
      a. Toilet Tissue (Roll) Dispenser:
         1) Jumbo Dual Roll: Model 5425, stainless steel dispenser.
      b. Grab Bars: Model 812 Series.
         1) Provide size and quantity as indicated in Drawings.
      c. Sanitary Napkin Disposal Unit: Model 4722-15 stainless steel surface mounted disposal with keyed lock, push flap door, and removable stainless steel wast receptacle.

d. Soap Dispenser: Model 6A01-110000 stainless steel surface mounted automatic foam soap dispenser.
e. Mirror: Model 781 Stainless Steel Channel Framed Mirror, size 24 inch x 36 inch.
   1) Public Bathrooms Reflective Surface: Polished stainless steel #8.
   2) Private Office Bathroom Reflective Surface: Tempered Mirror Glass.
f. Waste Receptacle: Model 3565 12 gallon stainless steel surface mounted framless receptacle.
g. Hand Dryers: Model 2B4 Elvari surface mounted stainless steel ADA hand dryer.
   1) Application: Bus Terminal Public Restrooms (2 total)
h. Paper Towel Dispenser: Model 2494 surface mounted automatic roll paper towel dispenser with motion sensor activation.
   1) Application: Private Office Bathrooms (2 total)
i. Needed Disposal: Model 989-11 Surface mounted stainless steel with removable needle disposal with tumbler lock.
   1) Application: Bus Terminal Public Restrooms (2 total)

B. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide three keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
   1. Application: Private Office Bathrooms (2 total)
   2. Reflective surface in bus terminal public restrooms: Polished Stainless Steel #8 mirror finish (2 mirrors total)

E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
   2. Material and finish: Antimicrobial, molded plastic, white.
   3. Application: On all supply and drain piping exposed to veiw and contact below sinks.
   4. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.

2.06 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: Bobrick B-239 x 34
   1. Provide one per Janitor/utility closet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on product data.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations and as indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

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SECTION 10 43 00
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. Accessories.

1.02 DEFINITIONS

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test schedules and recertification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automated External Defibrillators (AEDs):

1. Philips Medical Systems: www.usa.philips.com/#sle.
2. Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p: www.stryker.com/#sle.
3. ZOLL Medical Corporation: www.zoll.com/#sle.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.

1. Provide automated external defibrillators (AEDs) as indicated.

2.03 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Cabinet Construction: Non-fire-rated.

1. Formed stainless steel sheet; 0.036 inch thick base metal.

C. Cabinet Configuration: Surface mounted type.

1. Size to accommodate AED.
2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with two butt hinges.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

I. Finish of Door Pull or Handle: Stainless steel.

2.04 ACCESSORIES

A. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.

B. Alarm Contacts: Contact devices.

C. Cabinet Door Signage: 'AED" decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cabinet Lettering:
   1. Location: Face of door framing.

3.02 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers 2013.

C. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

1.07 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:

1. Basis of Design: Larsen's Manufacturing Company, Inc.; www.larsenmfg.com.
2. Other acceptable manufacturers subject to compliance with requirements:
   a. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   b. Nystrom, Inc: www.nystrom.com/#sle.

B. Basis of Design Fire Extinguisher Cabinets and Accessories:

1. Larsen's Manufacturing Company, Inc; www.larsenmfg.com.
   a. Where FE is indicated on drawings: Provide fire extinguisher and surface mounted cabinet.

1) Type: Surface Mounted suitable for specified fire extinguisher.
2) Basis-of-Design Product: Larsen 2409 SM
   (a) Other acceptable manufacturers subject to compliance with requirements:
      (1) Nystrom, Inc[<>]: www.nystrom.com/#sle.
      (2) Kidde, a unit of United Technologies Corp[<>]: www.kidde.com/#sle.
3) Door Style: Full Glass.
4) Finish: Aluminum, clear annodized class I.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
   2. OSHA compliant.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
      a. Typical Application Fire Extinguisher: Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
   2. Finish: Baked polyester powder coat, red color.
      a. Metal top (head) and valve
   3. Handles and Levers: Stainless steel.
      a. Provide hose and horn on each.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

2.03 ACCESSORIES

A. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
   1. Application: Extinguisher locations labeled as FE in Drawings.
   2. Provide wall mounted plastic sign:
      a. Basis of Design.
         1) Manufacturer JL Industries.
         2) Product Number: FE #24S
         3) Configuration: 3D Tent
         4) Size: 5-inches x 6-inches.
         5) “Bottom of sign to be mounted at 84” a.f.f.”

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).
   1. Application: Extinguisher locations labeled as FE in Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

3.03 MAINTENANCE

A. Provide a separate maintenance contract for specified maintenance service.

END OF SECTION

SECTION 11 11 36
VEHICLE CHARGING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric vehicle charging units.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for pedestal-mounted charging units.

1.03 REFERENCE STANDARDS

A. ISO/IEC 14443-4 - Cards and Security Devices for Personal Identification – Contactless Proximity Objects – Part 4: Transmission Protocol 2018.

B. ISO/IEC 15693-2 - Cards and Security Devices for Personal Identification - Contactless Vicinity Objects - Part 2: Air Interface and Initialization 2019.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2014.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. SAE J1772 - SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler 2017.

F. UL 2202 - Standard for Electric Vehicle (EV) Charging System Equipment Current Edition, Including All Revisions.

G. UL 2231-1 - Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements Current Edition, Including All Revisions.

H. UL 2231-2 - Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems Current Edition, Including All Revisions.

I. UL 2594 - Standard for Electric Vehicle Supply Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate this work with other installers to provide required electric power for specified charging units and accessory equipment being installed at designated locations.
   2. Coordinate this work with other installers to provide readily accessible location for disconnection as indicated and as required by NFPA 70.
   3. Notify Architect of any conflicts with or deviations from Contract Documents, and obtain documented directions before proceeding with this work.

B. Preinstallation Meetings:
   1. Conduct meeting with facility representatives to review charging unit and accessory equipment locations, and require attendance by each affected installer.

C. Sequencing: Do not install charging unit until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Submit manufacturer's standard catalog and data sheets for charging units and installed accessories; include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Manufacturer's Installation Instructions: Submit necessary application conditions and limitations of use stipulated by product testing agency; include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

D. Manufacturer's detailed field testing procedures.

E. Field quality control test reports.

F. Maintenance Contracts.

G. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer Qualifications: Company with minimum three years experience with similar charging units; manufacturer's authorized installer.

C. Maintenance Contractor Qualifications: Same entity as installer.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

E. Maintain at project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

1.08 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electric Vehicle Charging Units:
   1. Blink Charging Co: www.blinkcharging.com/#sle.
   2. ChargePoint, Inc: www.chargepoint.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.
   4. Source Limitations: Furnish electric vehicle charging units and accessory equipment produced by single manufacturer and obtained from single supplier.

2.02 ELECTRIC VEHICLE CHARGING UNITS

A. Provide electric vehicle charging units in compliance with NFPA 70 and including required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides functional intent indicated.

B. General Requirements:
   1. Listed and labeled as complying with UL 2594 or UL 2202.
   2. Provide personnel protection in accordance with UL 2231-1 and UL 2231-2.
   3. Enclosure Environment Type: In compliance with NEMA 250, Type 3R or Type 4, unless otherwise indicated.

4. Service Conditions: Provide charging units suitable for operation between minus 22 and 122 degrees F without derating.
5. Meet the connected functionality criteria for ENERGY STAR certified Electric Vehicle Supply Equipment (EVSE).
6. Capable of responding to time-of-use market signals.

C. Electric Vehicle Charging Unit:
1. Configuration: Dual port, pedestal mount or wall mount where applicable.
2. Charging: AC Level 2 with SAE J1772 connector(s).
3. Cable Length: 12 feet.
4. Power Output: 3.25 kW per port.
5. Network Connectivity: Cellular wide area network (WAN), Wi-Fi local area network (LAN); support remote station monitoring and configuration.
6. Software:
   a. Support management of driver authentication, payment methods, and pricing models.
7. Features:
   a. Overhead cable management.
   b. Liquid crystal display (LCD) driver interface.
   c. Card reader with ISO/IEC 15693-2 (vicinity card), ISO/IEC 14443-4 (proximity card), and NFC support.
   d. Integral surge protection.
   e. Customizable signage/branding areas.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of charging units are consistent with indicated requirements.

C. Verify that charging unit locations indicated are free from obstructions and meet manufacturer's minimum clearance requirements.

D. Verify that mounting surfaces are ready to receive charging units.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to charging units.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install charging units plumb and level.

3.03 FIELD QUALITY CONTROL

A. See Section 01 45 16-Field Quality Control Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Program system parameters according to requirements of Owner.

E. Confirm network connectivity.

F. Test system for proper operation.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

H. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 77 00-Closeout Procedures, for closeout submittals.

B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

A. Provide trouble call-back service upon notification by Owner:
   1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

SECTION 11 12 00
PARKING CONTROL EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking access controls.
   1. Vehicle Detection Loop

B. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors and components to be embedded in concrete.

B. Division 26: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

B. ITS (DIR) - Directory of Listed Products current edition.

C. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Provide data on operating equipment, characteristics, and limitations.

C. Shop Drawings: Indicate plan layout of equipment access lanes, curbing, mounting bolt dimensions, conduit and outlet locations, power requirements, and wiring diagrams.

D. Record Documentation: Record and submit actual locations of concealed conduit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code and requirements of authorities having jurisdiction for emergency vehicle access.

B. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

2.02 PERFORMANCE CRITERIA

A. Operating Temperature: Minus 20 to 140 degrees F.

B. Humidity: 15 to 95 percent RH noncondensing.

2.03 VEHICLE DETECTION

A. Vehicle Detection: For use in temperature range of minus 40 to 160 degrees F; consisting of detection unit in conjunction with sensing loop to activate parking revenue control device or access control device when vehicle enters or exits.

B. Sensing Loop: 14 gauge, 0.064 inch insulated wire; loop size of 48 by 72 inches, with loop extension cable and detector.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that electric connections are properly located and have necessary characteristics.

3.02 INSTALLATION

A. Install parking control system and components in accordance with manufacturer's instructions and in compliance with requirements.

B. Cut grooves in pavement surface, install vehicle detection loops and lead-in wires, and fill grooves with loop filler.

C. Install internal electrical wiring, conduit, junction boxes, transformers, circuit breakers, and auxiliary components as required.

3.03 MAINTENANCE

A. Provide service and maintenance of operating equipment for a period of two years from Date of Substantial Completion.

END OF SECTION

SECTION 12 93 13
BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Indoor bicycle racks.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2023.

C. ASTM C150/C150M - Standard Specification for Portland Cement 2021.

D. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

E. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2023.

1.04 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

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 size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle racks and accessories with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Indoor Bicycle Racks: Floor-Mount, Inverted "U" Type Basis of Design - Saris Infrastructure; Bike Dock Model 27215: www.sarisinfrastructure.com.
   1. Pipe Diameter: 2-3/8 inch O.D. Schedule 40 Steel Pipe.
   2. Size: 30 inch maximum width by 34 inch maximum height.
   3. Color: As selected by architect from manufactuers standard colors.
   4. Mounting: Floor-Flange Mounted.
   5. Location: Lower Level of Parking Structure.
   6. Quantity: As indicated on drawings

B. Acceptable alternate manufactuers subject to complaince with requirements:
   1. Velodome Shelters; U-Rack U-RD-SM: www.velodomeshelters.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks and accessories..

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not begin installation until unsatisfactory substrates have been properly repaired.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks and accessories are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install bicycle racks and accessories level, plumb, square, and correctly located as indicated on drawings.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 13 34 23.16
FABRICATED CONTROL BOOTHS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, factory-fabricated control booths.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete pad, foundations and anchor bolts.

B. Division : Mechanical services and connections.

C. Division 26: Electrical power service and wiring connections.

D. Division 27: Communication service and wiring connections.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures 2010, with 2013 Supplements and Errata.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

F. ASTM B632/B632M - Standard Specification for Aluminum-Alloy Rolled Tread Plate 2015.

G. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

H. ASTM C1036 - Standard Specification for Flat Glass 2016.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2012a.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

K. ITS (DIR) - Directory of Listed Products current edition.

L. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of this work; require attendance by affected installers.

1. Conduct meeting to verify control booth requirements, substrate conditions, utility connections, and manufacturer's installation instructions.

1.05 SUBMITTALS

A. See Section 01 33 23-Submittals, for submittal procedures.

B. Product Data: Submit product data sheets, including material descriptions, dimensions and profiles of components and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Submit plans, elevations, sections, construction details, and utility connections as necessary for this work.

1. Include design engineer's stamp or seal on each sheet of shop drawings.

D. Factory-Manufactured Building Approval Report: Provide necessary third party design approval and inspection report information in cooperation with local regulatory agency or authorities having jurisdiction.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's unopened packaging and store until ready for installation.

B. Protect components and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep materials free from dirt and foreign matter.

1.08 WARRANTY

A. See Section 01 78 36-Warranties, for additional warranty requirements.

B. Provide five year manufacturer warranty for fabricated control booths that fail in materials or workmanship within warranty period as indicated .

1. Includes coverage for exterior pre-finished surfaces against chipping, cracking or crazing, blistering, peeling, chalking, or fading and coverage for weather tightness of building enclosure elements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Fabricated Control Booths:

1. Austin Mohawk and Company, Inc: www.austinmohawk.com/#sle.
2. B.I.G. Enterprises, Inc; _____: www.bigbooth.com/#sle.
3. Porta-King Building Systems: www.portaking.com/#sle.

2.02 MANUFACTURED UNITS

A. Type of Application: Parking Booth.

1. Style of Booth: Rounded outside corners with flat roof.
2. Size: As indicated on drawings.
3. Material: Aluminum.
   a. Steel Structural Framework: Fabricated from 0.083 inch minimum wall thickness, 2 inch by 2 inch structural or mechanical tubing, with welded framework.
4. Platform: As indicated on drawings.

2.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide factory fabricated structures capable of withstanding the following loads and stresses without damage or failure.

1. Loads: Compliant with applicable ASCE 7 requirements.

B. Thermal Movement: Design control booth to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

C. Electrical Components, Devices, and Accessories: Listed and labeled by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction and installed in compliance with NFPA 70, and marked for intended application.

2.04 COMPONENTS

A. Windows: Provide extruded aluminum sash frames with glazing as indicated.
   1. Operable Windows: Provide cam locks, weather-stripping, and stainless steel ball-bearing rollers.
      a. Window Operation: Provide horizontal sliding windows.
   2. Screens: Provide insect screen for each operable window.
   3. Aluminum Finish: Clear Anodized, Class I.

B. Doors: Sliding door on one side.
   1. Sliding Door: Top suspended from aluminum track with ball-bearing rollers, 1-3/4 inch thick, insulated, with tubular frame fabricated from anodized aluminum, with full-height of door glazed.
   2. Deadlock: Mortise lever lock with removable cylinder capable of being master keyed.

C. Metal Wall Panel Assembly: Fabricate exterior face panel from 16 gauge, 0.0598 inch nominal thickness, galvanized steel sheet; and interior face panel from 16 gauge, 0.0598 inch nominal thickness, galvanized steel sheet; with 2 inch thick, expanded polystyrene (EPS) board insulation within cavity between exterior and interior face panels.
   1. Provide minimum wall panel insulation value, R-12.

D. Base/Floor Assembly: Provide 4 inch high base/floor assembly consisting of perimeter frame welded to booth structural framework.
   1. Fabricate frame from 2 inch by 4 inch galvanized steel structural tubing.
   2. Provide anchor clips fabricated from 1/4 inch thick galvanized steel plate, predrilled and welded to exterior of integral floor frame, with accessible interior pop outs and anchor plate covers.
   3. Subfloor: 2 inch overall thickness, assembly consisting of 0.079 inch thick galvanized steel bottom plate, rigid insulation, and rolled aluminum tread plate.

E. Roof Assembly: Provide insulated roofing assembly; sloped to drain at perimeter.
   1. Exterior Roof Panel: Fabricated from 20 gauge, 0.0359 inch nominal thickness galvanized steel sheet.
   2. Provide minimum roof/ceiling insulation value of R-19.
   3. Roof Configuration: Flat roof, with EPDM membrane.
   4. Metal Finish: As selected by Architect from manufacturer's standard line of colors.

F. Ceiling: Manufacturer's standard.

G. Interior Lighting Fixtures: Provide one, ceiling mounted, light-emitting diode (LED) lighting fixture, 48 inch long, with acrylic lens.
   1. Provide single-pole switch mounted adjacent to entry door to control light fixtures.

H. Casework: Provide reinforced base cabinets and wall cabinets At manufacturers standard location(s).
   1. Countertop: Stainless steel sheet.
   2. Base Cabinet Depth: 22 inch.
   3. Wall Cabinet Depth: 12 inch.

I. Heating/Air Conditioning Unit: Provide wall-mounted, thermostatically controlled, 208/230 VAC, 1,500 watt electric heater with fan-forced operation; capacity not less than 5,000 BTU/hr, and air conditioner with cooling capacity not less than 13,500 BTU/hr and enclosed within enameled steel cabinet.

J. Electric Power Service: Provide 125 amp, 120/240 VAC, single-phase, three-wire load center with at least four open circuits; located as indicated on drawings.
   1. Route copper wiring using 1/2 inch metal conduit.
   2. Provide at least one 120 VAC ground-fault circuit interrupter (GFCI) power receptacle.

2.05 MATERIALS

A. Steel:
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, commercial quality, G90 (Z275) coating designation; mill phosphatized.
   2. Zinc-Coated (Galvanized) Steel: Hot-dip galvanized in compliance with ASTM A123/A123M.

3. Structural Tubing: ASTM A500/A500M, Grade B.
4. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
5. Exterior Panels: Provide wall, soffit, and fascia panels with 14 gauge, 0.0747 inch, minimum thickness.
6. Interior Panels: Provide wall panels with 16 gauge, 0.0598 inch, minimum thickness.

B. Aluminum: Alloy and temper as recommended by manufacturer for type of use and finish specified, and as follows:
1. Rolled Tread Plates: ASTM B632/B632M; 1/8 inch aluminum diamond tread plate, alloy and temper 6061-T4 or 6061-T6.

C. Expanded Polystyrene (EPS) Board Insulation: Minimum density of 0.90 pcf (15 kg per cu m) and R-Value of 3.6 per inch, in compliance with ASTM C578, Type I.

D. Glazing: Select type and thickness of exterior glazing assemblies to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
2. Insulating Glass Units: Certified by an independent testing agency to comply with ASTM E2190.
a. Factory assembled units consisting of two 3/32 inch thick annealed float glass lites in compliance with ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
1) Coating: Low-E (passive type), on #2 surface.
2) Tint: Clear.
3) Unit Overall Thickness: 1 inch.
b. Metal Edge Spacers: Aluminum, bent and soldered corners.
1) Spacer Color: Black.
c. Edge Seal:
1) Color: Black.

2.06 FABRICATION

A. Fabricate booths completely in factory, and this includes but is not limited to the following:
1. Glazing of windows and doors.
2. Wiring of electrical and communication systems, made ready for on-site service connection.
3. Piping of mechanical system, made ready for on-site mechanical service connection.
4. Other systems, as required, for fully finished, functional and operational booth.

B. Separate different adjacent materials using non-conductive tape, paint, or other materials that will not be visible upon completion of this work.

C. Fabricate booths for forklift unloading by providing forklift pockets in base that are suitable for placement of structure on prepared foundations.

2.07 FINISHES

A. Steel Factory Finish: Manufacturer's standard coating.
1. Color: As selected by Architect from manufacturer's standard range of colors.

B. Operator and Exposed Hardware: Enameled, color as selected by Architect from manufacturer's standard line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, adjacent areas and conditions, and supporting foundation, with installer present, for compliance with manufacturer's requirements, including installation tolerances and other conditions affecting performance of this work.

B. Examine installed anchor bolts for accuracy, and verify that bearing surfaces are ready to receive this work.

C. Examine rough-in of required electrical, mechanical, and communication services prior to placement of structure. See Sections _____.

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

3.02 PREPARATION

A. Clean areas of supporting foundation thoroughly prior to installation.

B. Prepare substrate surfaces using methods as recommended by manufacturer under project conditions.

3.03 INSTALLATION

A. Install booth in accordance with manufacturer's written instructions.

B. Set booth plumb and aligned, baseplates level and true to plane with full bearing on concrete substrate, and securely fasten to concrete base with indicated anchorage. See Section 03 30 00.

C. Install connection to electrical, mechanical, and communication systems. See Sections _____

3.04 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

B. Prepare and start electrical, mechanical, and communication equipment and systems in accordance with manufacturer's instructions and recommendations.

3.05 ADJUSTING

A. Adjust doors, operable windows, and hardware to operate smoothly and properly without binding, and verify that locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving booth components in accordance with manufacturer's written instructions.

C. Touch-up, repair or replace damaged products or exposed finishes prior to Date of Substantial Completion.

3.06 CLEANING

A. Clean booth in accordance with manufacturer's written instructions.

END OF SECTION

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14 21 00

ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. Base Bid Section Includes: Project work consists of furnishing and installing three (3) machine roomless traction elevators with gearless machines located in the hoistway overhead. Machine roomless elevators shall be provided with control rooms to house the elevator control cabinets. Access to machines and sheaves for maintenance and service purposes shall be provided from the car top. Controls shall include regenerative drives and controls and gearless machines shall be non-proprietary.

B. Work Required:

1. Work of this section includes providing equipment, incidental material, transportation, all permits, all taxes and all labor required for a complete and operable elevator installation and all related maintenance of the newly installed equipment. This specification provides a broad outline of required equipment and does not describe the details of design and construction. Elevators shall be erected, installed, adjusted, tested and placed in operation by qualified elevator installers.
2. All work shall be performed in a first class, safe and workmanlike manner.
3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make a complete installation.

1.02 RELATED SECTIONS

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer. Also see elevator shop drawings for requirements.

1. **Division 1 - Construction Facilities and Temporary Controls:** Protection of floor openings and personnel barriers; temporary power and temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
2. **Division 3 - Concrete:** Elevator pit, and installation of guide rail inserts.
3. **Division 4 - Masonry:** Hoistway enclosure with fire-resistant rating as required by IBC Section 3002.1, install guide rail inserts, building-in and grouting hoistway door frames, grouting up to hoistway sills. Cutting and patching for hall signal fixture recess boxes, control room.

   Division 5 - Metals: Auxiliary support steel for supporting entrances and guide rails, hoisting beam at top of hoistway, bevel recesses and projections of more than 4", machine room door. A minimum of two lifeline attachments capable of withstanding 5,000 lb load per OSHA 29 CFR 1926.502, at the top front of the new hoistway.
4. **Division 7 - Waterproofing:** Waterproofing of elevator pit.
5. **Division 9 – Finishes:** Finish flooring in elevator car enclosure.
6. **Division 21 – Fire Suppression:** Sprinklers, where required by the Building Code, installed per NFPA 13. Note: Sprinklers are not anticipated to be provided in the hoistways or control rooms.
7. **Division 22 – Plumbing:** Indirect drain or sump with flush grate and pump, complying with SPS 382.33 and 382.36.

8. **Division 23 - Heating, Ventilating, and Air Conditioning:** Hoistway opening protection per Building Code requirements, ventilation and temperature control of elevator equipment in hoistways and in new control rooms.
9. **Division 26 - Electrical:**
    a. Fused disconnect switch or circuit breaker capable of being locked in the open position for mainline power.
    b. Electrical power for elevator installation and testing, including temporary power where required by elevator contractor.
    c. Notification to elevator controllers from automatic transfer switch indicating when elevators are on emergency power and notification of pending switch back to normal power.
    d. Disconnecting device to elevator equipment prior to activation of sprinklers, if provided.
    e. Branch circuit for car lighting with lockable OCPD 15 amp protection.
    f. GFCI receptacles in elevator pit and overhead.
    g. GFCI protected receptacle in control rooms.
    h. Single non-GFCI receptacle in pit for sump pump use, if provided.
    i. Lighting in control room, overhead machine area and pit with switch and guards.
    j. Branch circuit for cellular phone equipment in each control room.
    k. Fire alarm initiating devices at elevator landings and in hoistway, shunt trip devices where sprinklers are provided in the hoistway overhead or control room. Sprinklers are not required in the elevator hoistway or control room.
    l. Where required by IBC 2015 Sections 1009.8.1 and 1009.8.2, provide a two-way communication system on each accessible floor that is one or more stories above or below the level of exit discharge.
    m. Emergency power for elevator systems, 110v lighting and control room HVAC. See Section 2.06 for more detail.
10. **Other:**
    a. ABC fire extinguisher inside each elevator control room.
    b. Finish flooring in elevator car enclosures.
    c. Removable barricades at all hoistway openings in compliance with OSHA 29 CFR 1926.502.

1.03 REFERENCED CODES

A. Comply with applicable building and elevator codes, including but not limited to the following:
1. ASME A17.1/CSA B44-2016, Safety Code for Elevators and Escalators.
2. ADAAG, American Disabilities Act Accessibility Guidelines.
3. ICC/ANSI A117.1-2009, Accessible and Usable Buildings and Facilities.
4. NFPA 70- 2017, National Electrical Code.
5. NFPA 72-2019, National Fire Alarm and Signaling Code.
6. Wisconsin Administrative Code SPS 318, effective 5/01/2021.
7. Madison General Ordinance Chapter 40.
8. Commercial Building Code IBC-2015.

9. All other applicable codes.

1.04 SYSTEM DESCRIPTION

A. Passenger Elevator #1:

Equipment Requirements (Verify with elevator manufacturer)

1.	Quantity & Elevator No:	One (1), Elevator #1 (Simplex Operation)
2.	Type:	Gearless traction elevator with Class A loading.
3.	Application:	Machine Room-Less with Control Room.
4.	Elev #1 Net Travel:	Approximately 68’ 8” (per plans)
5.	Elev #1 Number of Stops:	7 front
6.	Elev #1 Landings:	In-line LL-*G-P2-P3-P4-P5-P6
7.	Rated Capacity:	4,000 lbs
8.	Rated Speed:	350 fpm
9.	Minimum Car Inside:	5’ 8” wide x 7’ 4” deep
10.	Hoistway Dimensions:	8’ 6” wide x 9’ 3” deep (final layout TBD)
11.	Pit Depth:	5’ 8”
12.	Clear Overhead:	19’ 10” maximum under hoisting beam
13.	Inside Cab Height:	7’ 9” minimum
14.	Entrance Size & Type:	Two speed side opening, 4’ 0” wide x 7’ 0” high
15.	Machine Location:	Inside the hoistway at the top
16.	Controller Location:	Control room per architectural drawings
17.	Main Power Supply:	480 Volts + or - 5% of normal, 3 Phase, with a separate equipment grounding conductor. (Verify)
18.	Lighting Power Supply:	120 Volts, single phase, 15 Amp, 60 Hz
19.	Signal Fixtures:	Manufacturer’s vandal resistant with metal push buttons
20.	Drive:	Regenerative, if available from manufacturer
21.	Emergency Power Operation:	To be provided
22.	Status Panel:	To be provided in Fire Command Center
23.	Auxiliary Status Panel:	To be provide in Parking Garage office.

B. Performance and Ride Quality (Elevator #1)

1.	Door Opening Time:	2.2 seconds
2.	Door Closing Time:	2.6 seconds
3.	Floor-Floor Performance:	9.6 seconds (12’ floor heights)
4.	Rated Speed:	$\pm$3% of contract speed under any loading condition
5.	Vertical Vibration:	12 - 17 milli-g maximum
6.	Horizontal Vibration:	10 - 15 milli-g maximum
7.	Vertical Jerk	4.6 $\pm$ 1.0 ft./ sec^3 maximum
8.	Acceleration/Deceleration:	2.62 ft./ sec^2

9.	In Car Noise:	50 – 55 dB(A) maximum
10.	Stopping Accuracy:	± 0.2 in. under any loading condition or direction
11.	Re-leveling Distance:	± 0.4 in. maximum

C. Passenger Elevators #2-3:

Equipment Requirements (Verify with elevator manufacturer)

1.	Quantity & Elevator No:	Two (2), Elevator #2-3 (Duplex Operation)
2.	Type:	Gearless traction elevator with Class A loading
3.	Application:	Machine Room-Less with Control Room
4.	Net Travel:	68’ 8” (per plans)
5.	Number of Stops:	7 front
6.	Landings:	LL-*G-P2-P3-P4-P5-P6
7.	Rated Capacity:	4,000 lbs
8.	Rated Speed:	350 fpm
9.	Minimum Car Inside:	7’ 5” wide x 5’ 5” deep
10.	Hoistway Dimensions:	21’ 0” wide x 7’ 2” deep (final layout TBD)
11.	Pit Depth:	5’ 8”
12.	Clear Overhead:	19’ 10” maximum under hoisting beam
13.	Inside Cab Height:	7’ 9” minimum
14.	Entrance Size & Type:	Single speed side opening, min 4’ 0” wide x 7’ 0” high
15.	Machine Location:	Inside the hoistway at the top
16.	Controller Location:	Control room per architectural drawings
17.	Main Power Supply:	480 Volts + or - 5% of normal, 3 Phase, with a separate equipment grounding conductor. (Verify)
18.	Lighting Power Supply:	120 Volts, 1 Phase, 15 Amp, 60 Hz
19.	Signal Fixtures:	Manufacturer’s vandal resistant with metal buttons.
20.	Drive:	Regenerative, if available from manufacturer
21.	Emergency Power Operation:	To be provided
22.	Status Panel:	To be provided in Fire Command Center
23.	Auxiliary Status Panel:	To be provide in Parking Garage office.

D. Performance and Ride Quality (Elevator #2-3)

1.	Door Opening Time:	2.1 seconds
2.	Door Closing Time:	3.5 seconds
3.	Floor-Floor Performance:	4.3 seconds (12’ floor heights)
4.	Rated Speed:	±3% of contract speed under any loading condition
5.	Vertical Vibration:	12 - 17 milli-g maximum
6.	Horizontal Vibration:	10 - 15 milli-g maximum
7.	Vertical Jerk	4.6 ± 1.0 ft./ sec^3 maximum

8. Acceleration/Deceleration: 2.62 ft./ sec^2
9. In Car Noise: 50 – 55 dB(A) maximum
10. Stopping Accuracy: ± 0.2 in. under any loading condition or direction
11. Re-leveling Distance: ± 0.4 in. maximum

E. The elevators shall be installed and adjusted to meet maintenance standards as published in the NEII-1 Building Transportation Standards and Guidelines by the National Elevator Industry, Inc. Compliance with paragraphs A-D above and NEII performance standards shall be in addition to requirements for the State of Wisconsin and City of Madison elevator acceptance inspection and certification process. Elevator shall comply with the minimum performance standards at final acceptance and throughout the warranty period.

F. Simplex Operation(#1): Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

G. Duplex Operation(#2-3): Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered at least one elevator shall park at landing *G with the doors closed, the other car shall park at the last landing served.

H. Provide microprocessor-based control system which utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of a service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop computer), permanent owner's license with terms acceptable to Owner, operation manual, and tool instructions must be provided in addition to the control system. Any access code needed for on-board or service tool diagnostics or adjusting shall be disclosed to Owner and elevator Consultant and shall not be subsequently changed during or at the end of the one year warranty and service periods.

I. Operating Features – Standard

1. Full Collective Operation
2. Anti-nuisance
3. Load Weighing Bypass
4. Automatic Fan and Light Shutdown
5. Firefighters' Service Phase I and Phase II Operation
6. Top of Car Inspection
7. Two Speed Fan
8. Keyed Hoistway Access Operation from both terminal landings
9. Independent Service Operation
10. Provision for Card Reader with six (6) twisted shielded pair in traveling cable (Card reader is provided by Others and installed by Elevator Contractor on car operating panel).
11. Provision for future camera with (1) coaxial cable and (1) untwisted shielded pair (UTP) in traveling cable.
12. Emergency Power Operation.
13. Status Panel: All three (3) elevators shall be provided with single status panel located in Fire Command Center per IBC requirements.
14. Auxiliary Status Panel: All three (3) elevators shall be provided with a single auxiliary status panel located in the Parking Garage office.

J. Control Systems: Control systems of proprietary design, such as those designed by Otis, Kone, Schindler and TK Elevator are not acceptable. Controls, driving machines and suspension means shall be non-proprietary. SIM or other cards shall not be removed and all software furnished with the project shall become the property of the Owner.

K. Door Control Features:

1. Provide a closed loop, microprocessor based linear door operator system. The door operator will facilitate smooth operation under varying environmental influences such as, temperature, wind, friction, and component variation. The processor will monitor the door's actual position and velocity compared to its desired position and velocity. If variations are detected in the profile the command will be automatically corrected. The Closed Loop Door Operator control system shall be located on the car top.
2. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
3. Car opening shall be provided with a non-contact electronic reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Door protection shall consist of a two-dimensional, multi-beam array projecting substantially across the entire car door opening with a minimum of 40 beams.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

1.05 SUBMITTALS

A. Project Schedule to be submitted within 30 days of award.

B. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:

1. Signal and operating fixtures, and operating panels.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics, including HP, FLA and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway and control room, where provided (BTU/hr).

C. Shop Drawings: Submit approval layout drawings per SPS 318.1007. Include the following:

1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing and location of each rail bracket.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Loads on hoisting beam.
5. Color rendering of car enclosure.
6. Clearances and travel of car.
7. Clear inside hoistway, clear overhead, control room, and pit dimensions.
8. Signal fixtures.
9. Location and sizes of access doors, hoistway entrances and frames.
10. Description of all SIL rated devices

D. Color Selection: Submit color charts of exposed finishes and materials for color selection from manufacturer's full range of standard colors, patterns, and finishes.

1. When requested, submit 3" square samples of car finishes and materials.

E. Operating and Maintenance Manuals: Provide one (1) electronic copy and two (2) separate hard copies of manufacturer's operating and maintenance instructions.

1. Bound manual or 8-1/2" x 11" binders with durable plastic cover, project and specification section identified on binder spine and cover.
2. Table of contents and index tabs dividing sections.
3. Complete replacement parts listing with part numbers and sourcing information.
4. Firefighters' Emergency Operation instructions.
5. Emergency Power Operation.
6. Operation, maintenance, and repair procedures for major components.
7. Adjustment, maintenance, and troubleshooting instructions for elevator controls including drive.
8. Detailed test procedures for all applicable Category 1 and Category 5 tests including detailed instructions for all SIL rated devices.
9. Maintenance manual submittal shall also comply with SPS 318.1007(2)(d).
10. O&M documents must be submitted to and approved by Consultant before issue of final invoice.

F. Wiring Diagrams: Provide legible "As-Built" schematic wiring diagrams of new control systems, which shall reflect all field revisions and factory updates. Provide one additional complete set each in electronic format and a full-sized hard copy in addition to a set stored in the elevator controller.

G. Test Reports: Inspection reports from City of Madison to document acceptance of elevator system installation.

H. Keys: Two (2) switch keys shall be provided for each and every key switch provided, properly tagged and identified for function to Owner.

1.06 QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Manufacturer: Provide elevator manufactured by a firm with a minimum of 10 years of experience in fabrication of elevator equivalent to those specified for this project. The controller, signal fixtures, door operator equipment, car frame and platform, and car enclosure must be produced by the manufacturer, and not be part of a purchased, assembled, or locally fabricated system.

C. Installer: Contractor shall use skilled installers, trained and experienced in installing the equipment. All work shall be performed in a workmanlike manner and is to include all materials, accessories, and labor necessary for a complete and proper operating system. Where a device or part of the equipment is referred to in the singular number, it is intended that such reference shall apply to as many devices as are required to complete the installation.

D. Regulatory Requirements: Elevator system design and installation shall comply with all applicable safety codes (see Section 1.03). Apply for any permits necessary for work under this Section, pay all State and Local permit and inspection fees, and obtain cutting or burning permits as required.

E. Fulfill and maintain all licensing requirements of SPS 305 and SPS 318 for the duration of the installation, maintenance, and warranty periods.

F. Provide copies of permit application "Conditionally Approved" by City of Madison Fire Department to Owner. The elevator approval shall be posted prior to construction at or near the equipment space, and a copy of the approved elevator plans shall be available at the site.

G. Provide permits, associated fees, and perform all required inspections and tests. The elevator contractor shall pay reinspection fees for deficiencies or violations that are the responsibility of the elevator contractor or his subcontractors per terms of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened protective packaging. Temporary storage of materials, job boxes, etc. outside of the elevator hoistway must be arranged with the General Contractor. The elevator contractor shall provide off-site storage until components are needed, as required by General Contractor. Protect equipment and finishes from damage during transportation, storage, and construction.

B. The elevator contractor shall keep work areas orderly and free from debris during the course of installation and clean up on a daily basis. If areas are not kept clean, Owner may clean those areas and deduct cost from contract. The elevator contractor shall regularly remove trash, materials, cartons, etc. generated by their work from the premises.

C. Provide protective coverings, barriers, etc. to protect car enclosure, entrances and door panels, and other equipment and finishes. All expenses of repairing work of other Trades damaged by elevator contractor shall be borne by elevator contractor.

1.08 WARRANTY

A. All equipment shall be warrantied by the elevator contractor for a period ending 12 months after the date of final elevator acceptance by Owner. Elevators turned over prior to completion of the final elevator shall be covered by a Complete Warranty package that shall remain in effect until 12 months after completion of the final (3rd) elevator. Warranty shall include correction of defective material or workmanship to the satisfaction of the Owner. Materials and workmanship of installation shall comply in every respect with the Contract Documents.

B. Warranty excludes ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

C. The Owner shall have the right to reject defective or inferior material or workmanship. The elevator contractor shall make modifications, adjustments, and improvements of new equipment and shall meet the performance requirements of this specification at no additional cost to Owner.

D. "Defective" is defined to include, but not limited to, operation or control system failures, failure of new components, performance below required minimum standards, excessive wear, unusual deterioration or aging of materials or finishes, finishes not complying with specifications, the need for excessive maintenance, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and other unusual, unexpected, or unsatisfactory conditions.

1.09 MAINTENANCE AND SERVICE

A. In addition to the warranty provisions, provide "complete maintenance" and 24 - hour callback service for a period beginning at the completion of the first elevator and continuing for 12 months after final completion and acceptance of the last (3rd) elevator by Owner. The cost of overtime callbacks shall be the responsibility of the Elevator Contractor.

B. Beginning with final acceptance of the elevator by Owner, a minimum of twelve (12) inspections for each elevator are required in the 12 month warranty and maintenance period, at approximately 30 day intervals. In the event the minimum site visitations are not provided as stipulated here, the elevator contractor shall extend the warranty and complete maintenance periods, and provide extended coverage for all callbacks, repairs, parts, testing, labor and any other items necessary to keep the elevator in like new condition until a minimum of twelve (12) maintenance examinations at approximately 30 day intervals have been completed.

C. It is stipulated that while the elevator contractor must start regular inspections upon substantial completion, the inspections shall not accumulate towards the 12 months maintenance service period in paragraph A until elevator contractor's completion of punch list and final acceptance of the elevator to the satisfaction of Consultant and Owner.

D. The preventive maintenance program shall include a scheduled inspection, cleaning, lubrication, adjustment, callbacks, and repair or replacement of worn or defective parts. All work shall be performed by skilled, trained, and competent employees of the elevator contractor and shall not be subcontracted. Contractor shall provide all material and labor, and only original equipment manufacturer (OEM) parts shall be used.

E. This service shall not include adjustments, repairs or replacement of parts without charge due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor or subcontractors.

F. Contractor shall provide a written record of work performed at the time of each visit and is solely responsible for all maintenance records requirements of the elevator Code including the quarterly check and documentation of Firefighters' Emergency Operation. Detailed maintenance records shall be kept in the service cabinet or other mutually agreeable location and shall be available to the Owner at all times.

G. Maintain the elevator controls, hoistway, car top, pit, control room, and equipment located in these areas in clean condition throughout the warranty and maintenance periods.

H. The elevator contractor shall respond on site within 2 hours of any request for service during regular working hours, and within 30 minutes for entrapments during regular working hours. Response from time of call to mechanic arriving on site shall not exceed 2 hours for overtime calls.

I. Prior to the completion of the 12 month warranty and maintenance period the elevator contractor shall perform the Category 1 testing on each elevator and document their findings on the required testing forms and on a test tag per the City of Madison. Copies of the test reports shall be kept in the on-site maintenance records.

J. At the conclusion of, or just prior to, the expiration of the one year warranty and maintenance period the Contractor shall verify that the counterweight runby meets the applicable requirements of A17.1 2016 and that the suspension means tension meets the requirements of A17.1 2016 8.6.4.1.3. Findings and suspension means tension measurements shall be included in the maintenance records.

PART 2 – PRODUCTS

2.01 DESIGN AND SPECIFICATIONS

A. Provide machine-room less traction passenger. Basis of Design:

1. Hollister Whitney – 201/211 MRL
2. Schumacher Elevator – Traction MRL

B. Specifically, the system shall consist of the following components:

1. An AC gearless machine mounted at the top of the hoistway using embedded permanent magnets.
2. Conventional wire ropes for elevator suspension and hoisting purposes.
3. LED lighting in all ceiling lights and signal fixtures.
4. Automatic shutdown operation for LED ceiling lights and car fan during unoccupied periods (sleep mode).
5. Controller located in remote control room per architectural drawings.
6. All other applicable code requirements for MRL elevators.

2.02 EQUIPMENT: CONTROLLER COMPONENTS

A. Controller – Basis of Design:

1. Smartrise C4
2. GAL GALaxy IV
3. MCE – Motion 4000

B. A microprocessor-based control system shall be provided to perform all of the functions of safe elevator operation.

1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
2. Provide control system utilizing on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop computer), permanent owner's license with terms acceptable to Owner, operation manual, and tool instructions must be provided in addition to the control system. Any access code needed for on-board or service tool diagnostics or adjusting shall be disclosed to Owner and elevator Consultant and shall not be subsequently changed during or at the end of the one year warranty and service periods.
3. Controller shall be separated into two distinct parts; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
4. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 volts AC,) and low voltage (< 30 volts DC).

C. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall return regenerated AC power back to the building grid.

D. The elevator control system shall provide:

1. Inspection control devices in the main controller and on the car top to run the elevator on inspection operation.
2. A push to stop emergency stop switch in the controller and adjacent to the driving machine, which when opened disconnects power from the brake and prevents the motor from running.
3. Means from the main controller to electrically lift and control the elevator brake in the event of a power outage, to safely bring the elevator to the nearest available landing.
4. Means to reset the governor overspeed switch from the main controller and also trip the governor.
5. Means to reset the emergency brake from the main controller when set because of an unintended car movement or ascending car over speed.
6. A visual display within the main controller shall indicate car position, speed, and direction.

E. Provide means of two-way communication between elevator car and control room per requirements of A17.1 2.27.1.1.4.

2.03 EQUIPMENT: HOISTWAY COMPONENT

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor and dual solenoid service and emergency disc brakes, all mounted at the top of the hoistway.

B. Governor: The governor shall be mounted in the hoistway.

C. Buffers, Car and Counterweight: Oil type buffers shall be provided.

D. Hoistway Operating Devices:

1. Push to stop emergency stop switch in the pit

2. Terminal stopping switches

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening. Guide rail brackets shall be positioned so that the guide shoes are within 18" of a guide rail bracket when the elevator is at any floor level.

G. Counterweight Roller Guides: Furnish and install spring tensioned roller guides at top and bottom of elevator car. Roller guides shall be ELSCO Model D, HW 379 or approved equal.

H. Wire Suspension Ropes: New traction steel wire suspension ropes shall be provided of the proper size, grade, construction, and ultimate breaking strength, as determined by the traction machine manufacturer and ASME A17.1-2016 requirements. New wire ropes shall be complete with new wedge clamp shackles at both rope terminations, rope data tag, and mounting hardware, including two rope clips per shackle. Wire rope specification shall also match original design requirements indicated on the crosshead data plate.

I. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.

J. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway, where required by ASME A17.1.

K. Pit Ladder: Steel access ladder furnished and installed by Elevator Contractor complying with elevator code requirements, including retractable ladder where required due to hoistway clearances. Where retractable ladders are provided, they shall be manufactured by Smart Elevator Tech, LLC or approved equal.

L. Wiring: Wiring for all hoistway electrical devices included in scope of the elevator system, hall fixtures, pit emergency stop switch, elevator status panel, and traveling cable for the elevator car.

M. Card Reader Installation: Provide all necessary coordination and assistance for the installation of card reader security, provided by Others. Card readers shall be surface mounted on car operating panel. Final location to be determined during submittal and layout review process.

N. Maintenance Access: All elevator equipment shall be installed in the constructed hoistways in such a manner as to provide clear and safe access to machines, governors and other overhead elevator equipment for purposes of maintenance and service compliant with the requirements of A17.1 2016.

O. Hoistway Entrances:

1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to support angles mounted in the hoistway and shall be of UL fire rated steel.

2. Sills: Aluminum with non-slip finish.

3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements and flush furniture steel on front side, suitably reinforced and drilled to accept the door operator equipment.

4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.

5. Door and frame finish: Satin stainless steel.

6. Sight guards: Provide on leading edge of hoistway door panels.

7. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

8. Star of Life Plates: Symbols not be less than 3 inches high shall be located on both side of each hoistway door frame at every landing.

9. Elevator ID plates: Located on both entrance jambs at the designated level and the alternate level.

2.04 EQUIPMENT: CAR COMPONENTS

A. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall utilize a Type "B", flexible guide clamp type safety.

B. Cab: Steel shell cab with applied panels. Basis of design, Industrial I. Stainless steel 5WL or other textured metal finish to be provided as selected by Owner.

C. Car Doors: Car doors shall be minimum 1-1/4" thick hollow metal construction filled with sound deadening material. Car sides of doors shall be faced with stainless steel 5WL or other textured metal finish as selected by Owner.

D. Car Front Finish: Satin stainless steel columns, full width transom, return, and car door panels.

E. Car Top: All steel construction or wood material clad on both sides with a natural finish aluminum panel. Car top shall have a concealed emergency exit and code compliant electrical contact.

F. Door Operator: Door operator shall be GAL MOVFE 2500-HL heavy-duty, linear-type motor driven operator utilizing closed-loop control design, operating car and hoistway doors simultaneously, maximum closing speed of two ft./sec; one ft./sec. per door panel. Provide hand-held diagnostic and programmable tool for door operators, where available from door operator manufacturer. Tool shall be the property of the Owner and remain on site in the control room.

G. Ceiling Type: Basis of Design – SnapCab Island Ceiling. Stainless steel suspended ceiling with recessed LED lighting.

H. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided with multilight LEDs to illuminate the elevator car in the event of building power failure. At least two light fixtures in the ceiling shall function as emergency lighting.

I. Fan: A two-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 2016 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan. Provide stainless steel protective grille.

J. Handrail: Handrails shall be provided on the side and rear walls of the car enclosure for each elevator. Handrails shall be 2” flat bar type with a brushed stainless steel finish. Ends are to be bent or returned towards the wall.

K. Car Sill: Aluminum car sills with non-slip finish shall be provided in each elevator.

L. Roller Guides: Furnish and install spring tensioned roller guides at top and bottom of elevator car. Roller guides shall be ELSCO Model B, HW 380 or approved equal.

M. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the suspension means at the top of the hoistway. A platform guard with a vertical length of at least 48” and meeting all applicable requirements of A17.1 2016 2.15.9 shall be provided.

N. The LED ceiling lights and the fan shall automatically shut off when the system is not in use and be powered back up after a passenger pushes a hall button to call the elevator.

O. Protective pad hooks and quilted fire retardant protective pads and hangars. Protective cab pads shall be provided for Elevator #1 and #2. If clamp type hangars are used, they shall securely hold the pads in place. Otherwise grommets and fixed pad buttons shall be provided.

2.05 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Signal Fixtures - General: Provide satin stainless steel coverplates. All call register pushbuttons, lanterns, emergency light, car or hall lanterns, jewels, and other visual indicators shall have LED illumination. All pushbuttons shall be vandal resistant round stainless steel buttons sufficiently durable, with illuminated call registration. All pushbuttons shall be comparable to Innovation Industries “Bruiser” series with round projecting vandal resistant stainless steel call register pushbuttons with counter-bored stop. Button type may be rejected during the warranty period should they fail to withstand normal building use.

B. Car Operating Panel - One main car operating panel (MCOP) shall be provided for every elevator. MCOP shall contain all push buttons, key switches, and message indicators for elevator operation in a single satin stainless steel coverplate. Each car operating panel shall be equipped with the following features, unless other indicated below:

1. Car Position Indicator at the top of and integral to the car operating panel.
2. Emergency lighting shall be provided from the ceiling lighting.
3. Replaceable stainless steel Elevator Data Plate marked with elevator capacity and Elevator number.
4. Fire Cabinet with Firefighter’s Phase II switch keyed FEO-K1, visual and audible signals, call cancel button, toggle stop switch, and Operating Instructions.
5. Service cabinet with toggle switches for light, 2-speed fan, independent service, and keyed access enable.
6. Exposed in-car keyed stop switch.
7. Illuminated call register floor pushbuttons.
8. Non-illuminated door open and door close buttons.
9. Alarm button, connected to a call bell that serves as an emergency signal, and which shall illuminate when activated.
10. Raised markings and Braille to the left side of each pushbutton.
11. Provide a self-dialing ADA compliant telephone installed inside a recessed telephone cabinet with push to open type hinged cover. Coordinate the programming and testing of the telephone, which shall enable emergency personnel within the building to establish two-way voice communications to each car individually. Two-way voice communication shall be established without any intentional delay and shall not require intervention by a person within the car. The means shall override communications to outside of the building, be compatible with customer’s telephone system and ASME A117.1-2009 and ASME A17.1-2016 compliant. Program to dial Owner’s phone monitoring service as primary number with Elevator Contractor’s number as secondary.
    1. New emergency phone shall be compatible with RATH Microtech Cellular Gateway elevator telephone system.
    2. Elevator Contractor to provide and install RATH Microtech Cellular Gateway inside elevator control room or hoistway in location with adequate cellular signal for reliable operation. Owner to provide direction for ATT or Verizon during submittal and review process. Owner shall be responsible for all services fees required to maintain cellular service activity.
12. Provide voice announcer for floor arrival.
13. Provisions for surface mounted card readers. Final location to be determined during submittals process.

C. Hall Lanterns: Provide hall lanterns indicating direction of elevator travel adjacent to each elevator entrance at every landing.

D. Combination Hall Lantern/Position Indicators: Furnish and install combination hall directional lantern with illuminated UP and DOWN arrows and audible signals and digital car position indicator for the elevator at the designated landing.

E. Hall stations shall have round illuminated satin stainless steel pushbuttons in flush mount vertical stainless steel coverplates. Up and down buttons shall be provided at the intermediate landings and a single call button at the terminal landings. Hall stations shall utilize vandal-resistant fixtures. Hall stations shall be designed to incorporate 'In Case of Fire' pictograph.

F. Provide separate fixture at designated landing containing the Emergency Power jewel and Communications Failure device. Location of fixture to be approved by Owner.

G. Keyed hoistway access switch at each terminal landing located within 12" of entrance. Access enable key switch in Car Operating Panel shall utilize the same key as the fixtures located at the terminal landings.

H. Firefighters' Key Box: A metal box shall be installed at the designated landing containing code required amount of FEO-K1 key switches, a machine room door key, and hoistway door unlocking key. The box shall be keyed 52219 or 25460. One box with the necessary key switches shall be provided and installed for each bank of elevators (#1, #2-3) with an additional box and keys located in the Fire Command Center adjacent to the Elevator Status Panel.

I. Elevator Status Panel: Provide one elevator status panel in Fire Command Center for Elevators #1-3. Include all raceways and wiring from elevator status panel to hoistways and controllers. Panel shall contain the following:

2" digital position indicator for each elevator

Direction indication for each elevator

Firefighters' Phase I emergency key switches

Phase I illuminated and audible signals

Emergency power illuminated signals

Normal power illuminated signal for each elevator

Out of service illuminated signal for each elevator

J. Auxiliary Elevator Status Panel: Provide one auxiliary elevator status panel in the Parking Garage office for Elevators #1-3. Include all raceways and wiring from elevator status panel to hoistways and controllers. Panel shall contain the following:

2" digital position indicator for each elevator

Direction indication for each elevator

Phase I illuminated signals

Emergency power illuminated signals

Normal power illuminated signal for each elevator

Out of service illuminated signal for each elevator

2.06 EMERGENCY POWER OPERATION

Each elevator shall be connected to run on emergency power as follows: When a signal from the building electrical system indicates loss of normal electrical power, the elevator shall return to its Main Floor. Elevator shall cycle its doors and be removed from normal service. All three elevators shall be designed to run simultaneously on emergency generator power.

All emergency power transfer switches that supply power to elevator equipment shall be capable of sending an Emergency Power Signal to the elevator controller. This signal shall consist of a Form C contact that will change state and maintain its state as long as the emergency power transfer switch has transferred to the emergency power source/generator.

All emergency power transfer switches that supply power to elevator equipment shall be capable of sending a Pre-Transfer Warning Signal that precedes the operation of the emergency transfer switch. This signal shall be available for a live-buss-to-live-buss transfer to emergency power and on transfer back to normal power. This signal shall precede transfer by a period of time as recommended by the elevator installer. The time period shall generally range from 10 to 20 seconds. The Pre-Transfer Warning Signal shall reset to normal when transfer takes place. The signal shall be available as a Form C contact. This signal shall put the elevator in a special service mode. The special service mode will bring the elevator to the nearest landing and open the doors. The special service mode will attempt to assure that the car is not in motion when the transfer of power takes place. The Electrical Contractor shall provide this signal to the elevator equipment.

Elevator car lighting and ventilation shall operate on emergency generator power.

Control room HVAC shall operate on emergency generator power.

PART 3 - **EXECUTION**

3.01 PREPARATION

A. Take field dimensions and examine hoistway, supports, and other conditions under which this work is to be performed. Adapt equipment to fit hoistway size shown on architectural drawings. Do not proceed with work until unsatisfactory conditions are corrected.

B. Notify General Contractor in writing of material discrepancies or other conditions detrimental to performance of work under this Section.

3.02 INSTALLATION

A. Installation of all elevator components except as specifically provided elsewhere by others.

B. All ferrous metals installed in the hoistway shall be painted with a rust inhibitive coating or be galvanized.

C. Install guide rails and all elevator components and accessories to provide a quiet, smoothly operating installation, free from excessive deflection or vibration, pulsations, or noise.

D. A clear path shall be provided to all components or equipment that requires maintenance, of not less than 18 inches clearance in the direction(s) required for maintenance access.

E. All field wiring required to perform work under this Section shall be provided in compliance with NFPA 70.

F. If required, field wiring and control interface between card reader and access control system provided by others in the elevator control room is included by the elevator contractor.

G. Assist in testing of elevator fire alarm initiating devices and recall operation prior to and at time of inspection.

H. Protect equipment and exposed finishes from damage during installation.

I. Make adjustments to elevator system to ensure acceptable elevator operation, and to comply with Section 1.04 Performance Requirements.

3.03 PRODUCT DELIVERY, CLEANUP

A. Contractor shall take precautions to secure the elevator hoistway during installation.

B. Deliver materials in original, unopened protective packaging. Provide protective coverings, barriers, etc. to protect equipment and finishes from damage during transportation, storage, and construction. Temporary storage of materials must be arranged with General Contractor.

C. Contractor shall keep work areas orderly and free from debris during the course of installation and clean up on a daily basis. If areas are not kept clean, the General Contractor may clean those areas and deduct cost from contract.

D. The car top, hoistway, control room, pit, and equipment located therein shall be thoroughly cleaned at the time of acceptance and shall be cleaned to Owner's satisfaction at the end of the one year warranty and maintenance periods. Hoistway cleaning shall include guide rails and rail brackets, platform apron and fascia, door panels, hangars, headers, and hoistway sills. Final cleaning of work, as applicable, shall include but not be limited to following:

1. Clean surfaces exposed to view; remove protective covering and clean surfaces at completion.
2. Clean finishes free of dust, lint, stains, films, adhesives and other foreign substances. Remove excess lubrication.
3. Remove construction debris trash, materials, cartons, etc. from the premises.
4. Touch up or otherwise restore damaged factory-painted or exposed finishes and surfaces with original paint and color as required.
5. Replace new or existing finishes and surfaces that cannot be repaired or restored to the Owner's satisfaction.

3.04 DEMONSTRATION AND ACCEPTANCE

A. The elevator contractor shall make all acceptance or other tests required by the governing codes and advise Owner and Architect in advance of date and time acceptance tests are to be performed.

B. Provide electronic copy of O&M documents to A/E and consultant for review within 30 days of the completion and turnover of the first elevator.

C. Demonstrate the operation of the elevator system to the Owner and Architect upon completion of installation and prior to final acceptance, including:

1. Installation compliance with specifications.
2. Conduct a running speed test with full load, checking starting, accelerating, deceleration, stopping g-forces, jerk, stopping accuracy, car ride and floor-to-floor performance times.
3. Operation of signal fixtures.
4. Door operation, closing force, opening and closing times as specified.
5. Firefighters' Emergency Operation
6. Emergency Power Operation
7. Promptly remove all work rejected by Architect or Owner for failure to meet specifications and replace to comply with requirements, at no additional cost to the Owner.
8. Rejected work which is not made good within a reasonable time, determined by the Owner, may be corrected by the Owner at Contractor's expense.

D. The elevator contractor shall demonstrate to Owner's satisfaction that control systems and all system devices are functioning properly and meet Section 1.04 Performance Requirements.

E. The elevator contractor shall instruct Owner's personnel in the proper use and operation of the elevator with the Owner or Owner's representative present prior to turning the elevator over for use. Review and demonstrate procedures, including Firefighters' Emergency Operation and Emergency Power Operation.

Such training shall include a familiarization with the elevator equipment, conducted by Elevator Contractor for a group of Owner's employees on one occasion. Up to 4 hours of training shall be included by Elevator Contractor. Owner may choose to video record training sessions at their discretion. Training shall be after all of the elevator O&M manuals have been submitted.

F. Work shall not be considered complete until accepted in writing by Owner, and then only after successful completion of all violations cited by the City of Madison inspector, and completion of Consultant and Architect's punch lists.

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SECTION 31 23 16

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Topsoil Excavation.
2. Topsoil Placement.
3. Common Excavation.
4. Borrow Excavation.
5. Excavation Below Subgrade (EBS).
6. Excavating Roadway, and Parking Areas.
7. Excavating for Drainage & Embankments.
8. Filling.
9. Finish Grading.
10. Placing Topsoil.
11. Soil Compaction.
12. Utility Line Opening (ULO).

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork.
2. Section 31 23 17 - Trenching.
3. Section 31 23 18 - Rock Removal.
4. Section 33 11 16 - Site Water Utility Distribution Piping.
5. Section 33 11 13 - Public Water Utility Distribution Piping.
6. Section 33 31 13 - Public Sanitary Utility Sewerage Piping.
7. Section 33 31 00 - Sanitary Utility Sewerage Piping.
8. Section 33 41 00 - Storm Utility Drainage Piping.
9. Section 33 41 13 - Public Storm Utility Drainage Piping.
10. Section 31 25 13 - Erosion Controls.

1.2 REFERENCES

A. Local utility standards when working in proximity of utility lines.

B. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
6. ASTM D6938 - 17 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type to testing laboratory when required or requested by Engineer.

C. Materials Source: Submit name and location of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each material from single source though out the work.

B. Perform Work in accordance with State of Wisconsin Department of Transportation Standard Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Salvaged topsoil or trucked-In topsoil if indicated on the bid form as specified in Section 31 05 13.

B. Subsoil Fill: Native backfill as specified in Section 31 05 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

C. Verify building and trench backfilling have been inspected.

D. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A. Call Diggers Hotline Information service at 1-800-242-8511 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Strip/Salvage Topsoil:
1. Strip topsoil to whatever depths encountered or to depths necessary to provide sufficient volumes to cover designated areas to the required depths in a manner to prevent intermingling with underlying subsoil or other objectionable material. All areas from which topsoil is obtained shall be cleaned, if necessary, by means of mowing weeds or other vegetation to a height of approximately six inches or less. The area shall be free of any litter such as rocks, brush, or other material of objectional nature.
2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water.
3. Stripped/salvaged topsoil may be stockpiled in areas designated on the plans or as directed by the Engineer so that it may be reclaimed and spread on the areas designated.
4. Stockpile in area designated on site and protect from erosion with silt fence.

3.4 TOPSOIL PLACEMENT

A. All areas designated to be covered with topsoil shall be undercut or underfilled with approved material to such depth that when covered with the required depth of topsoil, the finished surface will be in accordance with the required lines, grades, slopes, and cross sections.

B. The finished surface shall contain no dirt clumps, stones, sticks, or other debris larger than one inch in any dimension. Topsoil placed next to fixed surfaces, such as walks, curbs, concrete sidewalks or other borders shall be kept 3/4 inch below such fixed surfaces.

C. Place topsoil in areas where restoration is required to a nominal depth of 4 inches unless otherwise indicated on the plans.

D. Place topsoil during dry weather.
1. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
2. Remove roots, weeds, rocks, and foreign material while spreading.
3. Manually spread topsoil close to plant material, building, and concrete or pavement to prevent damage.
4. Lightly compact placed topsoil.
5. Excess topsoil shall be disposed of off-site unless otherwise stated in the plans.
6. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 TRUCKED-In TOPSOIL

A. Use when insufficient quantities of salvaged topsoil exist on site only with approval of Engineer.

B. Place topsoil according to TOPSOIL PLACEMENT item.

3.6 COMMON EXCAVATION

A. Common excavation shall consist of removal, satisfactory disposal, and placement of all materials of every description not otherwise classified on the bid form.

B. Excavate to in accordance to the lines, grades, thicknesses, and typical sections shown on the plans.

C. Provide temporary drainage and efficient management of surface water runoff to reduce the flow of storm water runoff into site excavations and construction areas.

D. Correct unauthorized excavation at no cost to Owner.

E. Any materials tracked on adjacent property or streets will be cleared immediately by the Contractor.

F. Excess material is to be disposed of off-site unless otherwise indicated.

3.7 PREPARING ROADWAY FOUNDATION

A. Vegetation of a height greater than one foot shall be cut and properly disposed of before ground is broken for excavation or before embankment is placed thereon. Heavy sod and other perishable material underlying proposed embankments within the limits of assumed one-to-one slopes extending outward from the outer limits of the finished shoulder line shall be removed. Muck, peat, and other unstable material shall be removed, disposed of, or otherwise treated as shown on the plans.

B. All suitable topsoil material from within the roadway limits shall be stripped and stockpiled or otherwise salvaged and stockpiled as shown on the plans or directed by the Engineer.

C. After suitable topsoil and required sod and other perishable or unsuitable materials have been removed, the ground underlying proposed embankments, within the limits of the assumed one-to-one slopes prescribed above, shall be compacted, or otherwise prepared as required to provide a foundation which will properly support the proposed embankment and which will permit attaining the density specified for the embankment.

D. All pavements, asphaltic surfaces, or rigid base courses occurring within the area of the roadbed slopes and underlying proposed embankments shall be completely removed to a depth of not less than 24 inches below the proposed finished grade line, or to such other depth as shown on the plans.

3.8 EXCAVATION BELOW SUBGRADE (EBS)

A. Excavation below subgrade shall consist of removal and satisfactory disposal of frost heave material, unstable soils, water bearing soil, topsoil containing unsatisfactory amounts of vegetation or other undesirable foundation material to such depths below the proposed finished

earth grade as shown on the plans or as directed by the engineer. The undercut material shall be replaced with base course. The base course used to replace the undercut material will be paid for under the unit price for base course.

B. Slope the bottom of the excavation so that water is drained and does not accumulate in excavated area.

C. The sub-grade shall be proof-rolled with a loaded tri-axle dump truck to determine unsuitable materials.

D. Verify that the sub-grade is dry and in suitable condition to support paving and imposed loads. Notify Engineer of any unsatisfactory subsoil conditions.

E. Base course placement and paving shall not occur until these conditions have been corrected.

F. Remove and dispose of off-site all lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

G. Backfill shall be made from selected materials as called for on the plans or as directed by the Engineer.

H. Repair or replace items indicated to remain damaged by excavation.

3.9 ROADWAY GRADING

A. All suitable material removed from excavation shall be used in the construction of the roadway, as far as practicable, and at such other places as shown on the plans.

B. All excavated slopes or areas and all embankment slopes or areas, designated to be covered with topsoil or salvaged topsoil, shall be undercut or underfilled to the necessary depth to provide for the specified amount of topsoil or salvaged topsoil to be placed and finished to the required grade lines and section.

C. Excavating shall be so performed as to avoid removing or loosening any material outside the required slopes, and any such material, which may be removed or loosened, shall be replaced and thoroughly compacted to the required cross-section.

D. All intersecting roads, approaches, entrances, and driveways shall be graded as shown on the plans or as laid out in the field by the engineer. The work of constructing intersections and private entrances, trimming shoulders and slopes, finishing, and blading the earth subgrade and completing the ditches to proper alignment, grade and cross-section shall follow the rough grading closely.

E. Grading operations shall not be performed to the detriment of the work of trimming and finishing the roadway and blading and maintaining the roadbed and earth subgrade.

3.10 FINISH GRADING IN PREP OF STONE BASE

A. The grading, trimming, and finishing shall be completed prior to construction of the subbase, base, or surface courses. The Contractor shall regrade after all underground construction activities have ended.

B. Prepare and construct the foundation to uniform density throughout.

C. Unless otherwise specified, the foundation shall be compacted to not less than the density for standard compaction of the particular material existing in the foundation.

D. Excavate and backfill all soft or yielding areas, holes, or other defects that occur due to traffic, hauling, poor drainage, unstable materials, or from any other cause before placing the base as directed by the Engineer.

E. Construct the foundation by scarifying, blading, leveling, and rolling as required to bring the foundation to the required grade, cross-section, and density.

F. The foundation for base course shall be constructed using a machine designed specifically for trimming foundations. The machine shall utilize automatic sensors to trim to the required grade and cross-section.

G. After shaping and compacting, provide a smooth foundation for the full width of the roadbed, to the required lines, grade, cross-section, and density for base course laying operations.

H. The final street grade, which will be used for a base to install curb and gutter, stone base and bituminous pavement, shall be required to be within 0.05' of elevations given on the grade stakes.

I. During grading operations and pending acceptance or placement of subbase, base or surface course, the contractor shall provide continuous maintenance of the entire roadbed and perform all blading and repair work necessary to keep the grade smooth and to the required grade and cross section.

J. Washouts caused by erosion shall be refilled and properly compacted, and payment for such filling shall accrue only from additional volume of material used.

K. Remove snow or ice, if any, from the foundation before placing the base.

3.11 DRAINAGE AND EMBANKMENTS

A. DRAINAGE

1. Inlets, outlets, swamp, berm and intercepting ditches, dikes, or intercepting embankments and channels shall be constructed where and as shown on the plans or where and as directed by the engineer and shall be maintained to the required section until acceptance. The work shall be performed in proper sequence with other work to provide adequate drainage and to minimize erosion and siltation.

B. EMBANKMENT

1. Materials:

a. Materials for embankment shall consist of approved materials and shall contain no logs, stumps, brush, or other perishable material. Humus-bearing soils, in excess of the quantity needed for salvaged topsoil requirements, and other soils not suitable for roadbed construction may be placed in the outside edges of the embankment, beyond the limits of an assumed one-to-one slope extending outward from the outer limits of the finished shoulder line. Frozen lumps of soil shall not be permitted to be placed in embankments inside the above designated assumed slope limits.

b. Materials to be incorporated in the top 8-inches of earth embankments shall be free from large stone, rock and broken concrete or other materials, which would significantly affect scarifying, compacting and finishing the subgrade.
c. Materials placed in those portions of embankments through which it is proposed to bore holes for or to drive piling shall contain no stone or broken concrete retained on a three-inch ring and shall be free from quantities of gravel, stone or broken concrete passing a three-inch ring, or other material which would significantly affect the boring of holes or driving of piling.

2. Placing Layers
a. Embankment shall be constructed in layers. The construction of an embankment shall begin at the lowest point of the fill below the grade, and shall be constructed in layers by spreading and leveling the material during placement. Individual layers shall be spread evenly to uniform thickness throughout and approximately parallel with the finished grade for the full width of the embankment, unless otherwise directed. The thickness of the layer shall be as necessary to secure the required compaction, generally not exceeding eight-inches.

3.12 COMPACTION

A. General:
1. All embankments shall be compacted in accordance with the requirements for standard compaction unless special compaction is called for on the plans or in the contract.
2. Embankment material shall not be compacted when the moisture content is such as to cause excessive rutting by the hauling equipment, or excessive displacement or distortion under the compacting equipment. Where such conditions exist, the materials shall be allowed to dry prior to compacting. When necessary, drying of such materials shall be accelerated by aeration or manipulation by means of blade graders, harrows, discs, or other appropriate equipment.
3. When the embankment material does not contain sufficient moisture to compact properly, water shall be added in quantities deemed necessary to aid and accelerate and to secure effective compaction.
4. Embankment materials which are placed outside the limits of an assumed one-to-one slope extending outward and downward from the outer limits of the finished shoulder line shall be compacted to a density not less than the density contemplated for standard compaction, except that the engineer may waive this density requirement for unstable materials permitted to be placed in embankments outside the above designated slopes.

B. Standard Compaction:
1. The material for the embankment shall be deposited, spread, and leveled, as herein before provided, in layers generally not exceeding eight inches in thickness before compaction. Each layer of the embankment shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be attained for each layer before any material for a succeeding layer is placed thereon.
2. The compaction shall be performed by specialized compaction equipment, supplemented by hauling and leveling equipment routed and distributed over each layer of the fill to make use of the compaction afforded thereby; unless the engineer determines that the compaction attained by the use of only the hauling and leveling equipment is satisfactory and sufficient. Should the engineer determine that such compaction is satisfactory and sufficient, specialized compaction equipment will not be required. Should the engineer determine that the compaction is not satisfactory or sufficient, specialized compaction equipment shall be used to accomplish the compaction.

3. Specialized compaction equipment shall include tamping rollers, pneumatic-tire rollers, vibratory rollers, or other types of equipment designed for compaction, which will produce the required results in the materials encountered and be subject to the approval of the engineer.
4. Tamping rollers, when used for compaction, shall exert a weight of not less than 150 pounds per square inch of tamping surface on each tamping foot in a transverse row.
5. Pneumatic-tire rollers or other equipment, when used for compaction, shall have a weight of not less than 150 pounds per linear inch of overall rolling width.

C. Special Compaction
1. Upon the properly prepared ground surface, the material for the embankment shall be deposited, spread and leveled, as herein before provided, in layers generally not exceeding eight inches in thickness before compaction, except that when the material being compacted is of a granular nature and the compacting equipment is adaptable for the purpose, the thickness of the layer may be increased to a maximum of 12-inches provided the required density is obtained. Each layer of the spread and leveled material shall be compacted, by means of suitable compaction equipment, to not less than the specified density before the succeeding layer is placed.
2. All embankment material placed within the limits of assumed one-to-one slopes extending outward and downward from the outer limits of the finished shoulder lines shall be compacted to not less than the density specified for the embankment and the embankment material placed outside such assumed slopes shall be compacted as specified in Subsection 3.9.A.
3. Embankments of six feet or less in height shall be compacted to at least 95 percent of maximum density for their full depth. Embankments over six feet in height shall have the top six feet compacted to not less than 95 percent of maximum density, and those portions more than six feet below the finished subgrade shall be compacted to at least 90 percent of maximum density, except that such portions occurring within 200 feet of a bridge abutment shall be compacted to 95 percent of maximum density.
4. The maximum density shall be determined in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop, AASHTO Designation: T180.
5. The density of compacted embankment material will be determined in accordance with the Standard Method of Test for Density of Soil-in-Place by the Sand-Cone Method, AASHTO Designation: T 191 or by other approved methods.

D. Subgrade Compaction in Cuts
1. The finished earth subgrade in cut sections for a width equal to the width of the proposed pavement plus shoulders shall be compacted as provided for standard compaction, unless special compaction is called for in the contract.
2. On grading projects where special compaction is required, the finished earth subgrade in cut sections to the width above described and to a depth of at least six inches shall be compacted to at least 95 percent of maximum density.

3.13 Utility Line Opening (ULO)
1. The work consists of excavating to uncover utilities for the purpose of determining elevation and potential conflicts as shown on the plans or as directed by the engineer. Perform the excavation in such a manner that the utility in questions is not damaged and the safety of the worker is not compromised. Perform the utility line openings as soon as possible and at least 10 days in advance of the proposed utility construction to allow any conflicts to be resolved with minimal disruption. Where utilities are within 6 feet of each other at a potential conflict locations, only one ULO shall be called for. In these cases, a single utility line opening will be considered full payment to locate multiple utilities. Utility line openings shall

include a trench up to 12 feet long as measured at the trench bottom, and of any depth required to locate the intended utility. All ULO's shall be approved and coordinated with the engineer. Notify the engineer of this work a minimum of 3 days prior to the work so they may be present when the work is completed.

3.14 BORROW EXCAVATION

A. Quality
   1. The material furnished shall consist of satisfactory soil or a mixture of satisfactory soil, stone, gravel, or other acceptable materials, which is of a character and quality satisfactory for the purpose intended. The material shall be free from sod, stumps, logs, grubs, and other perishable and deleterious matter.

B. Source
   1. Unless otherwise provided in the contract, the contractor shall make his own negotiations with property owners or others from whom he proposes to obtain borrow material.

C. Construction Methods
   1. The area from which material for Borrow Excavation is to be obtained shall be cleared and grubbed. All sod or other perishable or unsuitable material shall be removed from the proposed pit area. Borrow pits shall be excavated in a manner to permit accurate measurement of the material excavated and incorporated in the work.
   2. All stone, broken rock, boulders, and other materials, which are not satisfactory for use in the work, shall be disposed of by the contractor at his expense.
   3. All stumps, trees, logs, brush, tops and other debris resulting from clearing and grubbing work in borrow pit areas shall be disposed of by the contractor.
   4. Except in the case of commercial pits, the available topsoil or other soil of a nature conducive to plant growth, overlying such pit, shall be stripped off and placed in stockpiles in sufficient quantities to cover all surfaces of excavated areas within such pit to a depth of from four to six inches. When the depth of topsoil overlying such pit is less than four inches in depth, the topsoil shall be replaced to the original depth. After the pit has been trimmed and finished, such salvaged material shall be uniformly spread over all excavated areas of the borrow pit, except as otherwise authorized by the engineer in writing.
   5. After the excavated areas of the pit have been topsoiled the pit, disturbed areas adjacent thereto and associated haul roads shall be fertilized and seeded.

3.15 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Compaction testing will be performed in accordance with ASTM D1557 by Owner.

C. Owner, at their discretion, to perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D6938.
   2. Moisture Tests: ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: As determined by Owner.

3.16 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

END OF SECTION

SECTION 31 23 17
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities including services to 5 feet outside building or as indicated on the plans.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.
4. Rock Excavation

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
3. Section 31 23 16 - Earthwork
4. Section 31 37 00 - Riprap.
5. Section 33 11 13 - Public Water Utility Distribution Piping: .
6. Section 33 31 13 – Public Sanitary Utility Sewerage Piping:
7. Section 33 41 13 – Public Storm Utility Drainage Piping:

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: When required, describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Product Data: Submit data for geotextile fabric indicating fabric and construction.

D. Samples: Submit, in air-tight containers, 10 lb sample of each type of Type fill to testing laboratory.

E. Materials Source: Submit name of imported fill materials suppliers.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Wisconsin Department of Transportation or Standard Specifications for Sewer and Water Construction in Wisconsin.

B. Perform Work in accordance of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Competent Person experienced in design of this Work and comply OSHA standard 1926.650 Excavation.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

1.8 USE OF EXPLOSIVES

A. The Contractor shall observe the utmost care in the use of explosives so as not to endanger life and property. The methods of use, storing and handling of explosives and highly inflammable materials shall conform with applicable Federal, State and local laws and regulations including the rules of the Department of Safety and Professional Services (Wisconsin Administrative Code Chapter SPS 307).
   1. When blasting operations are conducted in communities, the shots shall be designed and initiated by a properly licensed Class 4 or 5 blaster.
   2. Blasting operations in communities shall comply with all local regulations and Contractor shall obtain necessary permits.
   3. Any person conducting blasting operations in a community shall notify the Engineer, Department of Safety and Professional Services, the local fire department, and the local law enforcement agency of the time and location of the blast.
   4. The Contractor is responsible to assure that the works to be accomplished are covered by insurance to an extent ample to cover any and all claims, damage, liabilities, awards or costs which might derive from or be attributable to such works or any adverse effects thereof, including, but not limited to, blasting influences. Any damages caused by blasting shall be repaired by the Contractor at his own expense.

PART 2 PRODUCTS

2.1 BACKFILL MATERIALS

A. Native backfill and select granular backfill, where required, shall be as specified in Section 31 05 13.

2.2 BEDDING AND COVER MATERIALS

A. Pipe bedding and cover materials shall be as specified in Section 31 05 13.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call Diggers Hotline Information service at 1-800-242-8511 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Perform trenching as specified in 29 CFR part 1926, OSHA subpart P for excavations and trenches.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Except by permission of the Engineer, not more than 250 feet of trench shall be opened at any one time. Not more than 200 feet of trench may be opened in advance of the completed pipe laying operations; and not more than one street crossing may be obstructed by the same trench at any one time.

E. Cut trenches to width indicated on Drawings. Sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches wide enough to provide free working space on each side of the pipe, preferably this space shall not exceed ½ the nominal diameter of the pipe of the size of the sewer, and never be less than 6 inches. The working space required shall depend upon the size of the pipe and the character of the material encountered in the excavation. The trench shall always provide sufficient space between the pipe and sides of the trench to allow for preparing the foundation, laying the sewer, and placing and compacting the backfill as specified.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. If utilities and other restraints make sloping or benching of the excavation impractical, employ a shoring system conforming to OSHA Subpart P.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by notify Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Base Aggregate Dense 3” per Section 32 11 23 and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

N. Remove surplus excavated material not intended for reuse, from site.

3.4 EXCAVATED MATERIAL

A. The excavated material to be used for trench backfilling must be stored so that it will cause a minimum of inconvenience to public travel, adjacent owners or tenants and other contractors or subcontractors.

B. The excavated material, which is not to be used for trench backfilling, shall be removed immediately from the site.

C. No claim for extra payment will be allowed because of the presence of quicksand or other materials tending to increase the excavating costs, unless specifically provided for in the Contract Documents, or as approved by the Engineer.

3.5 SURPLUS EXCAVATED MATERIAL

A. Surplus excavated material shall be disposed of by the Contractor at his own option and cost unless he is otherwise directed by the Contract Documents, with the exception in both cases as specified in the following paragraph.

B. The Engineer reserves the right to order up to 10% of the surplus excavated material to be delivered to streets, alleys, public properties, or other locations designated by the Engineer. The cost of delivering such surplus material to any point within a driving distance of two miles from the site of the work shall be included in the unit price bid for the work.

C. After delivery to any designated location, such material shall be leveled off by the Contractor.

3.6 EXCAVATION IN ROCK

A. When rock is encountered, it shall be stripped of earth and shale and the Engineer notified in order that he may measure or cross-section the same. In lieu of stripping the earth overburden prior to blasting, the Engineer and the Contractor may mutually agree on a method to define the vertical limits of the rock. Any rock excavated, before such measurement or agreement is made, will not be estimated, or paid for. Rock excavation shall be defined to include all hard solid rock in natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock, and masonry or concrete structures not shown on plans. Shales, hard pan, masonry and concrete rubble, boulders less than one (1) cubic yard which are not a part of or attached to sub-strata of rock, will not be considered rock excavation.

B. The classification of rock excavation does not apply to crushed aggregate or asphaltic bas or surface courses, or to Portland cement base or surface courses.

C. The trench in rock excavation shall be excavated to a point six (6) inches below the bell of a bell and spigot type pipe and six (6) inches below the outside of the barrel of a tongue and groove type pipe.

D. The pay width for rock excavation in open cut shall be the actual width of the excavated trench, but not to exceed the outside diameter of the pipe plus twenty-four (24) inches.

E. Existing utilities damaged during rock excavation or blasting will be replaced at the Contractor's expense.

F. If excavation methods leave undrained pockets in the rock surface, drain the depressions properly. If the engineer allows, the contractor may fill the depressions with engineer-approved impermeable material, at no expense to the Owner.

3.7 PIPE BEDDING

A. Bedding and cover material for utilities shall conform to Section 31 05 13. The standard trench section shall be as specified below.

B. Sanitary Sewer

1. Class C (ASTM C12) shall be used for all gravity sanitary and storm sewers, PVC water main, and PVC force main: The pipe shall be bedded in compacted Class I material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6-inches under the barrel and shall extend one-tenth to one-sixth of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to minimum depth of 6-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Class I.

2. Class I material shall be as specified in Section 31 05 13.

C. Storm Sewer
1. Class B (ASTM C12) shall be used for all gravity storm sewers: The pipe shall be bedded in compacted Class I material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6 inches under the barrel and shall extend to the spring line of the pipe. The remainder of the side fills and to minimum depth of 12-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Select Granular Backfill per Section 31 05 13.

D. Water Main
1. Type 3 Embedment according to AWWA C600 shall be used for ductile iron pipe: Pipe shall be bedded on 6-inches minimum of loose soil with backfill lightly consolidated to 12-inches above the top of pipe. Loose material shall be select granular backfill or screenings, free of rocks, foreign materials, and frozen earth.
2. Class C (ASTM C12) shall be used PVC water main: The pipe shall be bedded in compacted Class I, II, or III material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6 inches under the barrel and shall extend one-tenth to one-sixth of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to minimum depth of 6-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Class I, II, or III.

E. Unstable Foundation: If the bottom of the trench is of undesirable material, such as organic soil, or the presence of ground water causes a condition that cannot adequately support the main, the unsuitable material shall be removed and replaced with Class I material. Depth greater than 3" will be considered extra work.

3.8 SHEETING AND SHORING

A. Open-cut trenches shall be sheathed and braced as required by applicable Federal and State Codes, by the Contract Documents, and as may be necessary to protect life, property, or the work. When close sheathing is required, it shall be driven so as to prevent soil from entering the trench either below or through such sheathing.

B. For any trench section, the Engineer may allow close sheathing to be set in place rather than be driven, providing that ground conditions are suitable and that the trench is properly spot braced prior to the placing of sheathing. Any voids behind the sheathing shall be immediately filled with backfill gravel.

C. Lower Limits of Sheathing:
1. The Engineer reserves the right to order the sheathing driven to such additional depths below the pipe as may be required for the protection of the work.
2. Where the sheathing must be driven below the top of a concrete cradle or envelope, tarpaper or other suitable material shall be used to break the bond between the concrete and the sheathing so as to permit the removal of the sheathing.

D. Design sheeting and shoring to be removed at completion of excavation work.

E. Removal of Sheathing and Bracing:
1. Trench sheathing and bracing, including sections, which have been ordered left in place, shall be removed for a distance of three (3) feet below the established street grade or the existing surface grade, whichever is lower.

2. Trench sheathing and bracing shall be removed before the trenches are flooded, but only when and in such manner as will insure adequate protection of the completed sewer or water structures and adjacent underground or surface structures, and prevent the disturbance of adjacent ground. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheathing, except that which must be left in place, shall be removed after the backfilling has been completed or has been brought up to such elevation as to permit its safe removal.

F. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

G. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

H. Cost of Sheathing and Bracing:
1. The cost of furnishing, placing and removing of sheathing and bracing in open-cut trench, and the leaving in place of sheathing and bracing specifically indicated on the plan or in the Contract Documents, shall be included in the unit price bid for the work.
2. Sheathing and bracing shall include all stringers, wales and cross braces deemed necessary by the Engineer to protect the work.
3. The cost of furnishing and placing shoring and bracing in tunnel construction shall be included in the unit price bid for such work in tunnel.

I. The right of the Engineer to order sheathing and bracing left in place shall not be construed as creating any obligation on his part to issue such orders. His failure to exercise his right to do so shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work of constructing the sewer, water main, or appurtenances occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.

J. Portable Trench Box or Sliding Trench Shield
1. Portable trench boxes or sliding trench shields complying with OSHA regulations may be used. Use of the shield shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work of constructing the sewer, water main, or appurtenances occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.
2. Care shall be taken when a trench box or shield is moved ahead so as not to pull the already jointed pipe apart, leave voids around the pipe wall or change the alignment.
3. Where a concrete cradle or envelope is required, tarpaper or other suitable material shall be used to prevent a bond between the spacer and the concrete, so as to permit moving of the shield without disturbing the pipe, cradle, or envelope. A suitable spacer between the concrete and the shield shall be provided.
4. The width of the trench shield or box shall be such that a minimum six (6) inch horizontal clearance is maintained between the pipe and shield at all times.
5. Any voids between the trench box or shield and the undisturbed trench wall within the pipe zone (bottom of trench to top of cover material) shall be filled with crushed stone chips or backfill gravel, immediately after the box or shield is positioned.

3.9 SUPPORT OF UNDERGROUND STRUCTURES

A. Concrete backfill shall be used to support sewers, building sewers, water mains, and other utilities crossing trenches. With prior written approval of the Engineer, the Contractor may substitute reinforced concrete beams.

3.10 BACKFILLING

A. NATIVE BACKFILL
   1. Unless otherwise specified, material excavated from an open trench may be used for backfilling if it meets the requirements of Section 31 05 13 and is approved by the Engineer. Where excavated material is used for backfilling and there is a deficiency due to the rejection of a part thereof, the Contractor, upon the written order of the Engineer, shall furnish an additional quantity of select granular backfill.
   2. Vegetable or other organic matter, all types of refuse, large pieces, or fragments of concrete and frozen materials are unsuitable for backfilling.
   3. Native backfill material shall be used in streets only where soil is of proper moisture content so that the required compaction can be achieved. Where compaction requirements cannot be achieved, granular backfill shall be used.

B. SELECT GRANULAR BACKFILL
   1. Trenches shall be filled with select granular backfill where specifically called for on the plans or if directed by the Engineer when native backfill does not conform to Section 31 05 13.

C. All pipe or manholes with a rubber gasket or resilient type joint shall be backfilled within 24 hours after installation. Pipe sewers or manholes with cement mortar joints shall not be backfilled until initial set has occurred.

D. Large stones or hard or frozen lumps of earth will not be allowed in the backfill. Material, which has frozen in the stockpile, shall be replaced with acceptable backfill by the Contractor at his own expense.

E. After the cover material has been placed, the backfill shall be deposited and consolidated in accordance with this Section. The Contractor will be held responsible for any damage to underground structures.

F. Unless otherwise specified, native material excavated from an open trench may be used for backfilling if approved by the Engineer. Where excavated material is used for backfilling and there is a deficiency due to the rejection of a part thereof, the Contractor, upon the written order of the Engineer, shall furnish an additional quantity of granular backfill.

G. In existing pavement and roadways, the trench shall be backfilled to the existing surface, subject to surfacing requirements as indicated on the plans. In streets under construction, in open areas and in easements, the trench shall be backfilled to the existing ground surface or to the proposed or established grade, whichever is lower, unless otherwise specified.

H. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

I. Place and compact backfill material above the pipe in layer no more than 12 inches deep, to the top of the trench. Compact to the same degree as the material next to the trench.

J. Do not walk or work on the completed pipe, except as necessary to tamp or backfill, until backfilling the trench to at least 2 feet above the top of pipe.

K. Employ placement method that does not disturb or damage utilities in trench, and existing facilities to remain. Tamp or ram each layer thoroughly with proper tools that do not injure or disturb the pipe.

L. Maintain optimum moisture content of fill materials to attain required compaction density.

M. Do not leave more than 25 feet of trench open at end of working day.

N. No sewer or water main shall be backfilled in absence of the engineer's construction representative without the opportunity to observe the installation. In case the Contractor fails to observe this requirement, he shall uncover the pipe where requested and backfill the trench at his own expense.

O. Contractor shall provide temporary drainage and efficient management of surface water runoff to reduce the flow of storm water runoff into site excavations and construction areas.

P. Protect open trench to prevent danger to Owner and the public.

3.11 CONSOLIDATION OF BACKFILL

A. All backfill material shall be consolidated. Fill material shall be placed in lifts such that the required density is achieved throughout the entire lift with the equipment used by the contractor. The contractor shall place smaller lifts if the required compaction cannot be obtained. Fill material beneath paved areas and within five (5) feet of paved areas shall be consolidated as follows; within three (3) feet of the surface 95% of maximum dry density, below three (3) feet from the surface to one (1) foot above the pipe 90% of maximum dry density, backfill material beneath non-paved areas shall be consolidated to a compaction density of a minimum of 90% of maximum dry density, as determined by the Modified Proctor Test (ASTM D1557).

B. Mechanical Compaction of Earth or Gravel. Unless otherwise directed by the Engineer, mechanical compaction of backfill material shall be used to achieve the results required. All initial required compaction testing will be performed by the Engineer at no cost to the Contractor. The cost of required re-tests due to test failures shall be paid by the Contractor. The Contractor shall fully cooperate and provide whatever assistance, time and safe access is necessary for the performance of the tests. The trench shall be kept free of visible water during the backfilling and compaction work. The cover material shall be placed over the pipe and care shall be taken not to exert undue stress on the pipe during the compaction operation. The thickness of compacted lifts shall be such that allows the density throughout the entire thickness of the lift to meet the density requirements, with the compaction equipment used by the Contractor. The Contractor shall use smaller lifts if the required compaction cannot be obtained.

C. Jetting/Flooding of Granular Soils or Gravel. Jetting or flooding of granular soils or gravel for backfill consolidation will only be allowed if approved by the Engineer. Granular soils or gravel backfill shall be settled by jetting or flooding the trench with water after backfill has been placed. Compaction results obtained by jetting or flooding shall conform to this Section. The Contractor shall provide an adequate supply of water.

D. Contractor shall compact under and along the side of the pipe with a jumping jack or plate compactor.

E. Special compaction methods around manholes and other appurtenances shall be used to insure proper compaction.

F. Any backfill found to be deficient in meeting the mechanical compaction specification shall be re-excavated and re-consolidated at the Contractor's expense. The costs of retesting backfill consolidation found to be deficient shall be paid by the Contractor.

3.12 INTERFERENCE OF UNDERGROUND STRUCTURES

A. When an underground structure interferes with the work to such an extent that an alteration of the plan is required, such alteration shall not be made without the prior approval of the ENGINEER. If the alteration results in a change in the cost to the CONTRACTOR, the ENGINEER will issue a change order for such altered work.

B. No pipe, conduit, or other underground structure shall be allowed to remain in, penetrate, reduce the cross-sectional area, or abridge the use of any sewer or appurtenance to be constructed under the contract.

C. Where a previously unknown underground structure is encountered in the trench or tunnel of the proposed sewer, and because of interference, such part of the structure requires relocation, or chipping away of a part of the structure, the CONTRACTOR shall immediately notify the ENGINEER.

D. Where the line and/or grade of the proposed sewer conflicts with an existing water main, the OWNER will arrange to relocate the water main at no cost to the CONTRACTOR or negotiate with the CONTRACTOR to perform such required relocation as an extra, unless otherwise specified. The CONTRACTOR shall in either case excavate the area around the water main to allow sufficient room to relocate the main.

E. No extra compensation will be paid for unavoidable delays caused by the interference of existing underground structures.

F. In the event that the above-mentioned relocation is to be made for the convenience of the CONTRACTOR, the CONTRACTOR shall first notify the ENGINEER and the structure owner of his desire to relocate such structure or to discontinue the service; and receive from the structure owner permission for relocation or discontinuance of service. Replacement to original position and condition shall be made at no cost to the OWNER.

G. All sewer, building sewers or drains under proposed installation shall, when deemed necessary by the ENGINEER, be enveloped, capped, or bridged with concrete. Such work is considered incidental to the proposed installation.

3.13 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Under Paved Areas : Plus or minus 1 inch from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.14 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557. ASTM D698. AASHTO T180.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: One (1) test per two (2) lift per 200 feet of trench if required by Engineer.

3.15 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

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SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sediment and Erosion Control
2. Site Stabilization
3. Silt Fence
4. Inlet Protection
5. Tracking Pad
6. Erosion Mat
7. Ditch Check
8. Gabions
9. Sediment Basin
10. Sediment Trap
11. Dust Control
12. Soil Stabilizer
13. Rip Rap

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork.
2. Section 31 10 00 - Site Clearing.
3. Section 31 23 16 - Earthwork.
4. Section 32 91 19 - Landscape Grading.
5. Section 32 92 19 - Seeding.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:
   1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on geotextile.

C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.

D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for all materials.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Wisconsin Department of Natural Resources Best Management Practices.

1.6 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 ENVIRONMENTAL AND EROSION CONTROL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. At a minimum, the following erosion and sediment control measures shall be implemented at all construction sites.
   1. Sediment from overland flow shall be prevented from leaving the work site by installing straw bales or silt fencing, parallel to the contours, downhill from the work area.
   2. During pipeline construction, excavated material shall be placed on the high side of the trench. All trench water shall be discharged into a settling basin or through a filtering device prior to release into a storm sewer or stream. At the end of each day the trench shall be backfilled, compacted, and stabilized.
   3. Storm sewer inlets shall be protected from runoff by encircling with straw bales or silt fencing.
   4. Stone tracking pads shall be installed at all construction site exits to prevent soil tracking. Tracked soil shall be collected from paved roads located near construction sites on a daily basis.
   5. Minimize surface area of bare soil exposed at one time.

6. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
7. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

PART 2 PRODUCTS

2.1 GEOTEXTILE MATERIALS

A. Furnish materials in accordance with State of Wisconsin Department of Transportation standards.

B. Geotextile Fabric: Furnish in accordance with State of Wisconsin Department of Natural Resources Best Management Practices.

2.2 EROSON MAT

A. Erosion mat shall be listed on the Wisconsin DOT Product Acceptability List (PAL) and be a 100% biodegradable blanket of the class and type indicated on the plans or bid form. Curlex Netfree by American Excelsior or equal.

B. Staples for anchoring the erosion mat in place shall be U-shaped, biodegradable landscape stakes. Staples to be e-staple by American Excelsior or equal.

2.3 SILT FENCE

A. Geotextile Fabric.

1. The Geotextile fabric shall consist of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combination thereof. Submit a certificate of compliance certifying that geotextile conforms to the following:

TEST	METHOD	VALUE MINIMUM REQUIREMENTS
Minimum Grab Tensile Strength (cross machine direction) (lb)	ASTM D-4632	100
Minimum Grab Tensile Strength (machine direction) (lb)	ASTM D-4632	120
Maximum Apparent Opening Size (equivalent standard sieve)	ASTM D-4751	No. 30
Minimum Permitivity	ASTM D-4491	0.05 S^{-1}
Minimum Ultraviolet Stability (strength retained at 500 hours of exposure)	ASTM D-4355	70%

2. The geotextile fabric shall be insect, rodent, mildew and rot resistant.

B. Fence Support System

1. The fence support system shall comply with plan requirements.

2.4 INLET PROTECTION

A. All fabrics used as part of an inlet protection device must be selected from the list of approved fabrics certified for inlet protection, Geotextile Fabric, Type FF in the current addition of the WisDOT Product Acceptability List (PAL).

2.5 TRACKING PADS

A. The aggregate for tracking pads shall be 3 to 6 inch clear or washed stone or as directed by the Engineer. All material to be retained on a 3-inch sieve.

2.6 DITCH CHECK

A. Ditch checks shall be constructed out of the material as called out on the plans or bid items. All ditch checks must be constructed out of stone, straw bales, or other engineered products found on the Wisconsin Department of Transportation Erosion Control Product Acceptability List (PAL).
   1. Stone ditch checks shall be constructed of a well-graded angular stone, a D_{50} of 3 inch or greater, sometimes referred to as breaker run or shot rock.
   2. Straw Bales shall be straw, hay, or other approved material, in good condition, of the size shown on the plans. Stakes shall be wood or metal of the size shown on the plans.
   3. Straw Wattle Ditch Checks shall be AEC Premier Straw Wattles or approved equal. Straw Wattles shall be 12 inches in diameter by 10 feet long.

2.7 GABIONS

A. Gabions shall be constructed and filled with stone as specified on the plan details.

B. Gabion baskets shall consist of PVC coated wire and shall be 3-feet wide by 3-feet tall and to the lengths and heights as shown on the plans or as directed by the Engineer.

C. Fabric placed around the gabion shall be DOT Type DF.

2.8 SEDIMENT BASIN

A. Material shall be as called out on the plan details.

2.9 SEDIMENT TRAP

A. Material shall be as called out on the plan details.

2.10 DUST CONTROL

A. Material shall be as called out on the plan details or bid items.

B. Material applied shall conform to the requirements of Section 623 of the Wisconsin Department of Transportation Standard Specifications and the Wisconsin DNR Conservation Practice Standard 1068.

2.11 SOIL STABILIZER

A. Soil stabilizer shall consist of WisDOT Type B stabilizer from the PAL unless otherwise indicated on the bid form. Soil stabilizer shall conform to the Wisconsin DNR Conservation Practice Standard 1050.

2.12 Rip Rap

A. Furnish materials in accordance with Section 606 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 EROSION CONTROL REQUIREMENTS

A. Erosion control is the responsibility of the Contractor until acceptance of the project.

B. The erosion control measures and structures shown on the plans and described in the specifications shall be considered the minimum erosion control requirements. These measures shall be installed prior to start of construction and must be maintained and adjusted as necessary throughout construction.

C. The Contractor shall be responsible for checking erosion control measures at the end of each week and after a rain event of 0.5” or more throughout the length of construction. Contractor shall complete and maintain a copy of the WDNR erosion control inspection form for each inspection. Contractor shall also provide a copy to Engineer.

D. Contractor is responsible for implementation and maintenance of erosion control measures until the disturbed area is stabilized. All erosion control measures shall be in working condition at the end of each working day. The site will be considered stable when no soil leaves the site as a result of storm events and the areas served have established permanent vegetative cover. Adjustments shall be made to the erosion control measures as required.

E. Maintaining a clean job site including sweeping dust and sediment off from the adjacent streets shall be the responsibility of the contractor and shall be incidental to all other construction.

3.3 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Clear only those areas designated for the placement of improvements or earthwork before placement of the final cover. Perform stripping of vegetation, grading, excavation, or other land disturbing activities in a logical sequence and manner that will minimize erosion. If possible, schedule construction for times of the year when erosion hazards are minimal.

D. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.

E. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 14 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 at percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.

F. Stabilize diversion channels, sediment traps, and stockpiles immediately.

G. Do not locate any soil or dirt piles which will remain in existence for more than 7 consecutive days, whether to be worked during that period or not, within 25 feet of any roadway, parking lot, paved area, or drainage structure or channel (unless intended to be used as part of the erosion control measures.)

H. Do not discharge water in a manner that will cause erosion or sedimentation of the site or receiving facility.

3.4 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

3.5 EROSION MAT

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1052 for Non-Channel Erosion Mat products and Wisconsin DNR Conservation Practice Standard 1053 for Channel Erosion Mat products.

B. In all cases, lining installation and anchoring must be performed in strict compliance with the manufacturer’s recommendations and guidelines.

C. The erosion mat shall be placed on a specified area immediately after the seeding or sodding operations have been completed. All stones or clods over 1-1/2 inches in diameter and all roots, sticks or other foreign material, which would interfere with the mat bearing completely on the soil or sod, shall be removed prior to placing the mat.

D. Any small stones or clods, which prevent contact of the mats with the soil, shall be pressed in the soil with a small lawn-type roller or by other effective means. The mat shall have its lateral edges so impressed in the soil as to permit runoff water to flow over it.

E. In the event methods and details for placing erosion mat are incorporated in the plans, the work shall conform thereto.

F. Any seeded areas damaged or destroyed during erosion mat placing operations shall be reseeded as specified for the original seeding. All surplus excavation or materials, and all stones, clods or other foreign material removed in the preparation of the seeded soil or sodded surface for placing the mat, shall be disposed of by the contractor.

G. Following the placing of the mat, water shall be uniformly applied to the area sufficiently to moisten the seedbed to a depth of two inches and in a manner to preclude washing or erosion.

H. The contractor shall maintain the erosion mat and make satisfactory repairs of any areas damaged by erosion, traffic, fires, or other causes until acceptance of the work.

I. The matting strips shall be rolled on or laid in the direction of the flow. The mat shall be spread evenly, smoothly, in a natural position without stretching and with all parts bearing on the soil. Wood fiber blanket shall be placed with the netting on top. Adjacent strips shall overlap at least four inches. Strip ends shall overlap at least ten inches. All overlaps shall be made with the upgrade section on top.

J. The upgrade end of each strip shall be buried at least six inches in a vertical slot cut in the soil and the soil pressed firmly against the embedded blanket.

K. The mat shall be anchored in place with vertically driven staples, driven until their tops are flush with the soil. Staples shall be spaced at three-foot centers along mat edges and be alternately spaced at three-foot centers through the center. Staples shall be at ten-inch centers at end or junction slots.

L. Erosion mats shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

3.6 SILT FENCE

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1056.

B. Installation and Removal

The silt fence shall be erected prior to starting any construction operation, which might cause any sedimentation or siltation at the site of the proposed silt fence.

The silt fence shall, when possible, be constructed in an arc or horseshoe shape with its ends pointing up slope. The silt fence shall be constructed to the dimensions and in accordance with the details shown on the plans. Silt fences shall be removed, as determined by the engineer, after the slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Materials remaining after removal shall become the property of and shall be disposed of by the contractor.

C. Inspection and Maintenance

The contractor shall inspect all silt fences weekly and immediately after each rainfall and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the contractor. In addition, the contractor shall make a daily review of the location for silt fences and filter barriers in areas where construction activity changes the earth contour and drainage runoff to ensure that

the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed as approved or directed by the engineer.

Sediment deposits shall be removed when the deposit reaches approximately one-half of the volume capacity of the silt fence as determined by the engineer and disposed of as directed by the engineer. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

3.7 INLET PROTECTION

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1060.

B. Inlet protection shall be Type D (Catch-All) unless otherwise called out on the plans or bid form.

C. Inlet protection shall be provided at all existing inlets prior to construction and proposed inlets following inlet construction. Inlet protection shall be installed in such a manner as to prevent sediment from entering the inlet.

D. Inlet protection shall be inspected by the Contractor following rain events of 0.5” or greater and at least once per week. Deposited sediment shall be removed and properly disposed of.

E. The contributing drainage area to the inlet protection device shall be one acre or less. In instances where a larger contributing drainage area exists, runoff shall be routed through a properly designed sediment trapping or settling device upstream of inlet.

F. Filter Fabric Barrier Criteria (See Detail):
   1. Inlet protection Type A devices shall be utilized around inlets and unpaved areas until permanent stabilization methods have been established. Type A devices shall be utilized on inlets prior to installation of curb and gutter or pavement, and where safety considerations are not compromised on the site.
   2. Inlet protection Type B shall be utilized after the casting and grate are in place.
   3. Inlet protection Type D shall be utilized in areas where other types of inlet protection are identified as incompatible with roadway and traffic conditions, causing possible safety hazards when ponding occurs at the inlet. Type D shall only be used after casings are in place on top of the inlet boxes.
   4. Type D inlet protection shall conform to the details as shown in the plans. There shall be a three-inch space between the bag and the sides of the inlet to prevent the inlet sides from blocking the overflow; and shall only be used in inlets deeper than 30 inches from the top grate to the bottom of the inlet. If such clearance is not available, cinch or tie the sides of the bag (with rope or ties) to provide clearance.

G. Criteria Applicable to the Post-Paving/Curbing Phase of Construction
   1. Inlet protection Types B, C and D are applicable to post paving construction (see detail).
      a. Type B shall be utilized on inlets without curb box.
      b. Type C shall be utilized on street inlets with curb heads. A 1 ½” x 3 ½” minimum, piece of wood shall be wrapped and secured in the fabric and placed in front of the curb head as shown on the plans. The wood shall not block the entire opening of the curb box and be secured to the grate with wire or plastic ties.
      c. Type D.

H. Remove inlet protection devices once contributing drainage area is stabilized with appropriate vegetation or impervious area.

3.8 TRACKING PAD

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1057.

B. Clear stone tracking pads shall be constructed at each construction site entrance prior to any traffic leaving the site.

C. Tracking pads shall be 50”L x 25’Wx1’D, unless otherwise specified.

D. On sites with a high water table, or where saturated conditions are expected during the life of the practice, stone tracking pads shall be underlain with a WisDOT Type R geotextile fabric to prevent migration of underlying soil into the stone.

E. Tracking pads shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

F. The tracking pad performance shall be maintained by scraping or top-dressing with additional aggregate.

G. Tracking pad stone or crushed aggregate base course shall be used to cover utility trenches to prevent erosion on an as needed basis.

3.9 DITCH CHECK

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1062.

B. The ditch checks are to be constructed to the dimensions, material and locations as indicated on the plans.

C. Ditch checks must be installed with the center lower than the sides forming a weir.

D. The contractor shall be responsible for installing the ditch checks and ensuring that the site is not susceptible to erosion at the end of each work day.

E. Ditch checks shall be in place during rough grading and be removed once the site has been stabilized as directed by the Engineer, unless intended to be part of a permanent stormwater management plan.

F. Ditch checks shall be inspected by the Contractor following rain events of 0.5” or greater and at least once per week. Sediment deposits shall be removed when deposits reach 0.5 the height of the barrier. Removal of sediment may require replacement of stone. Maintenance shall be completed as soon as possible with consideration to site conditions.

3.10 GABIONS

A. Gabions shall be installed as shown in the plan details and in accordance with the manufacturer’s recommendations.

B. Fabric shall be placed under, around, and between all soil/gabion interfaces.

3.11 SEDIMENT BASIN

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1064.

B. Clear and grub storage area and embankment foundation area site as specified in Section 31 10 00.

C. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

D. Construct rock basin at outlet end of pipe, as specified in this Section. Place embankment material, as specified in Section 31 23 23. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 23.

E. On entire sedimentation basin area, apply soil supplements and sow seed as specified in Section 32 92 19.

F. Mulch seeded areas with hay as specified in Section 32 92 19.

3.12 SEDIMENT TRAP

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1063.

B. Clear site, as specified in Section 31 10 00.

C. Construct trap by excavating and forming embankments as specified in Section 31 23 16 and Section 31 05 13.

D. Place coarse aggregate or rock at outlet as indicated on Drawings.

E. Place geotextile fabric, as specified for rock energy dissipater.

F. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 16.

G. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 32 92 19.

H. Mulch seeded areas with hay as specified in Section 32 92 19.

3.13 DUST CONTROL

A. Execute Work by methods to minimize the dispersion of dust during the course of construction by application of water or other methods as approved by the Engineer to all areas within the project creating dust dispersion from the Contractor's operations, and from regular vehicle traffic.

B. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1068.

C. The application rate shall be per the manufacturer’s recommendations.

D. Dust control methods shall be applied whenever dust dispersion becomes a nuisance, or as directed by the Engineer.

3.14 SOIL STABILIZER

A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1050.

B. The application rate shall be per the manufacturer's recommendations.

C. Apply as directed by the Engineer.

3.15 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. When required, broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

3.16 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

3.17 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Field test concrete in accordance with Section 03 30 00.

D. Compaction Testing: As specified in Section 31 23 23.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Compaction Testing: One for each lift.

3.18 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.19 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit construction traffic over paving for 7 days minimum after finishing until 75 percent design strength of concrete has been achieved.

D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

3.20 Rip Rap

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Do not place riprap over frozen or spongy subgrade surfaces.

C. Place geotextile fabric over substrate, lap edges and ends.

D. Place riprap at culvert pipe ends and the discharge piping as indicated on Drawings.

E. Installed Thickness: 24-inch average.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

GENERAL

1.1 SUMMARY

A. Section Includes:
1. Base Aggregate Dense.
2. Geotextile Fabric – Street Subgrade.

B. Related Sections:
1. Section 31 23 17 – Trenching & Backfilling: Compacted fill under base course.
2. Section 32 12 16 - Asphalt Paving: Binder and finish asphalt courses.
3. Section 32 91 19 - Landscape Grading: Topsoil fill at areas adjacent to aggregate base course.
4. Section 33 05 13 - Manholes and Structures

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
2. Wisconsin Department of Transportation Standard Specifications

1.3 SUBMITTALS

A. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

B. Material sources and gradations shall be submitted to the Engineer for review. A sample of material from each source shall be submitted to the Engineer for testing and approval prior to construction.

1.4 QUALITY ASSURANCE

A. Aggregates furnished for the work shall conform to quality and gradation requirements hereinafter set forth. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with Sections 301 and 305 of the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, latest edition.

C. The Engineer may prohibit the use of crushed stone from limestone/dolomite deposits that have thinly bedded strata or strata of a shale nature. The Engineer may also prohibit the use of aggregate from deposits or sources known to produce unacceptable material.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. The aggregates shall be well graded between the limits specified and conform to the following gradation requirements:

Percentage by Weight Passing (WDOT 305.2.2.)			
Sieve No.	Base Aggregate Dense, 3-inch	Base Aggregate Dense, 1¼-inch	Base Aggregate Dense, ¾-inch
3 inch	90-100	---	---
1½ inch	60-85	---	---
1¼ inch	---	95-100	---
1 inch	---	---	100
¾ inch	40-65	70-93	95-100
⅜ inch	---	42-80	50-90
No. 4	15-40	25-63	35-70
No. 10	10-30	16-48	15-55
No. 40	5-20	8-28	10-35
No. 200	2.0-12.0	2.1-12.0 [1 3*]	5.0-15.0 [2]
[1] Limited to a maximum of eight percent in base course placed between old and new pavement. [2] 8.0-15.0 percent, if base is ≥50 percent crushed gravel. [3] 4.0-10.0 percent, if base is ≥50 percent crushed gravel.			

B. Base Aggregate: 5-inch Select.

Sieve Size	Percent Passing
5 inch	90-100
1-1/2 inch	20 to50
No. 10	0 to 10

C. Open Graded Base Course.

Sieve No.	Open Graded, 3-inch	Open Graded, 1-inch
3 inch	100	---
2½ inch	90-100	---
1½ inch	25-60	---
1 inch	---	90-100
¾ inch	0-20	---
⅜ inch	0-5	45-65
No. 4	---	15-45
No. 10	---	0-20
No. 40	---	0-10
No. 200	---	0-5

2.2 ACCESSORIES

A. Geotextile Fabric: Mirafi 600X, or approved equal.

B. Geogrid Reinforcement: Geogrid shall be Tensar Tx140, Syntex SBX 11 (Type 1) or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
1. Contractor shall notify Engineer 24 hours prior to when the proof roll will take place.
2. Proof roll substrate with fully loaded tri-axle truck to indentify soft spots.
3. Remove soft substrate and replace with compacted fill or dense graded base – 3 inch or 5 inch select if approved by Engineer.
4. Engineer will cross-section EBS to determine volume in place.
5. Engineer's recommendations shall not relieve Contractor of their warranty obligations.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Prior to placing crushed aggregate base course, the roadway subgrade shall be compacted. The roadway subgrade shall be fine graded to elevations shown on the plan based on the roadway profiles and typical sections.

B. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

C. Do not place fill on soft, muddy, or frozen surfaces.

D. Water and rework or re-compact dry foundations as necessary to ensure proper compaction, or as the engineer directs.

E. Correct all soft or yielding areas, holes, or other defects that occur due to traffic, hauling, poor drainage, unstable materials, or from any other cause before placing the base.

3.3 AGGREGATE PLACEMENT

A. Place aggregate equal thickness layers to total compacted thickness and width indicated on Drawings.

B. Roller compact aggregate to 95 percent maximum density.

C. All equipment used for hauling and spreading crushed aggregate base course shall be the weight, type, capacity, and method of operation such that no damage will result to the existing subgrade or base course in place. Equipment used for spreading shall be designed and operated to spread the material in uniform layers without significant segregation.

D. Equipment used for densification or compaction shall be of the static type, vibratory type, or a combination of both types.

E. If using a pneumatic roller, do not exceed a compacted thickness of 6 inches per layer. For the first layer placed over a loose sandy subgrade,

F. Level and contour surfaces to elevations, profiles, and gradients indicated.

G. Maintain optimum moisture content of fill materials to attain specified compaction density.

H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

I. When aggregates are measured by the ton, scales or weighing equipment shall be tested by the Engineer or by authorized testing firms or agencies as often as the Engineer deems necessary to ensure their accuracy.

J. Prior to acceptance of the Crushed Aggregate Base Course, all areas shall be proof rolled with a loaded tandem-axle truck, to be observed by the Engineer. If this test roll shows any deflection or cracking of the base course, the base course shall be removed in these areas and subgrade excavated as necessary to remove all wet or unsuitable material. These areas shall be backfilled with approved material as directed by the Engineer.

K. The Contractor shall be responsible for and maintain the base course until accepted.

L. The Contractor shall minimize the dispersion of dust from the base course, including shoulders, during construction and maintenance operations, until acceptance of the base course, by the application of water or other approved dust control materials as provided in the contract or required by the Engineer.

M. Install geotextile fabric over subgrade in accordance with manufacturer's instructions when directed by Engineer.
1. Lap ends and edges minimum 6 inches (150 mm).
2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/4 inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557 by Owner.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

C. Frequency of Tests: As determined by Owner.

3.6 COMPACTION

A. Compact materials to 98 percent of maximum density as determined from test strip, in accordance with ASTM D2940.

END OF SECTION

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SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving upper layer and lower layer.
5. Tack coat.

1.2 REFERENCES

A. State of Wisconsin Department of Transportation Standard Specifications and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.

B. Material Certificates: For each paving material, from manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the Wisconsin Department of Transportation.

B. Perform Work in accordance with Sections 450, 455, 460, and 465 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

C. Quality Management Program (QMP) provisions are not required on this project.

1.5 PROJECT CONDITIONS

A. Transporting and Delivering Mixtures
1. Deliver the mixture to the paver receiving hopper at a temperature between 260-300° F. Asphalt delivered below 260° F may be rejected by Engineer. Cover all loads during inclement weather or when the ambient air temperature falls below 65° F.

B. Environmental Limitations:
1. Tack Coat: Apply tack coat only when the air temperature is 36° F or more and the surface is dry and reasonably free of loose dirt, dust, or other foreign matter. Do not apply if weather or surface conditions are unfavorable or before impending rains.

2. Place asphaltic mixture only on a prepared, firm and compacted base, foundation layer, or existing pavement substantially surface-dry and free of loose and foreign material. Do not place over frozen subgrade or base, or when the roadbed underlying the foundation or base is temporarily unstable from the effects of frost heaving. Unless the contract provides otherwise, incorporate loose roadbed aggregate as a part of preparing the foundation, in shoulder construction, or dispose of as the engineer approves.

3. Do not place asphaltic mixture when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 36 F for upper layers or 32 F for lower layers unless the engineer allows in writing. The contractor should place HMA pavement for projects in the northern asphalt zone between May 1 and October 15 inclusive and for projects in the southern asphalt zone between April 15 and November 1 inclusive. WisDOT CMM 4-53 figure 2 defines asphalt zones. Notify the engineer at least one business day before paving.

4. Submit a written cold weather paving plan to the engineer at the preconstruction meeting. In that plan outline material, operational, and equipment changes for paving when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 40 F. Include the following:
   a. Use a WisDOT-accepted HMA mix design that incorporates a warm mix additive from the department's approved products list. Do not use a foaming process that introduces water into the mix.
   b. Identify the warm mix additive and dosage rate.
   c. Identify modifications to the compaction process and when to use them.
   d. Engineer written acceptance is required for the cold weather paving plan. Engineer acceptance of the plan does not relieve the contractor of responsibility for the quality of HMA pavement placed in cold weather.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, Performance Graded Binder as specified:
   1. PG 58-28

B. Tack Coat: ASTM D 977 emulsified asphalt or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 MIXES

A. Asphalt Paving Mixtures: Design in accordance with HMA Pavement LT 58-28 S of Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition, and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications), unless otherwise noted.

B. Asphaltic mixture, which, in the judgment of the Engineer, is not sufficiently mixed or is defective in another manner, will be rejected.

C. POROUS PAVEMENT (Alternate)

Mix Properties:

- Aggregates shall be in conformance with WiDOT Specifications for 9.5 mm
- Asphalt binder shall be grade PG 58-28+12GTR modified AC with rubber.
- Asphalt binder content shall be between 5.7% - 6.0%.
- Air Voids shall be 18% - 20% (Va at 50 Gyrations).
- Tensile Strength Ratio (TSR at 5 cycles freeze/thaw) shall be 80% min. per ASTM D4867.
- Draindown at production temperature shall be 0.3% maximum.
- Granulated rubber at 1% - 3% of 15-minus by weight of mix.
- High temperature fibers (minimum of 450 degree flash point) at 3-5 pounds per ton of mix.
- Recycled Asphalt Product (RAP) at 10% max.

Aggregate Properties

- LA Abrasion loss of 13% max. @ 100 revolutions; 45% max. @ 500 revolutions per AASHTO T 96.
- Soundness at 12% max. loss per AASHTO T 104.
- Freeze-Thaw loss at 18% max. per AASHTO T 103
- Fractured faces: 2 faces – 90% min; 1 face 100% min.
- Thin or elongated: 5% max 5:1 ration per ASTM D4791.

Mixture Gradation

Sieve	
3/4"	-
1/2"	100
3/8"	90 -100
#4	30 - 40
#8	10 -20
#16	5 - 15
#30	3 -10
#200	1 - 4
VMA (%)	25 min

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll the sub-base with a loaded tri-axle dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Contractor shall notify Engineer to inform him when proof rolling will take place. Provide a minimum of 24 hours notice. Engineer's recommendations shall not relieve Contractor of their warranty obligations.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

C. Verify gradients and elevations of base are correct.

D. Verify structure grates, frames, lids are installed in correct location and elevation.

3.2 EXISTING WORK

A. Saw cut and notch existing paving as indicted on Drawings. Recompact existing unbound-aggregate base course to form new subgrade.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.3 TACK COAT

A. Apply tack coat in accordance with Section 455 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Place asphalt pavement in accordance with Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
   3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

B. Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted in accordance with Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

C. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

D. Compact all layers of HMA mixture to 91.5% of target maximum density. The lower layer may be reduced to 89.5% if constructed directly on crushed aggregate.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Lower Layer: Plus or minus 1/4 inch (6 mm).
   2. Upper Layer: Plus 1/4 inch (6 mm), no minus.

3.9 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them.

END OF SECTION

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SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate [subbase] [base course].
   2. Concrete paving for:
      a. Concrete sidewalks.
      b. Concrete stair steps.
      c. Concrete curbs and gutters.
      d. Concrete parking areas and roads.

B. Related Sections:
   1. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
   2. Section 31 23 23 - Fill: Compacted subbase for paving.
   3. Section [32 11 23 - Aggregate Base Courses.
   4. Section 32 12 16 - Asphalt Paving: Asphalt [wearing course] [curbs].

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
   1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   6. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   7. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   8. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   9. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   10. ASTM C33 - Standard Specification for Concrete Aggregates.

11. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
12. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
13. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
14. ASTM C150 - Standard Specification for Portland Cement.
15. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
16. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
17. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
18. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
19. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
20. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
21. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
22. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
23. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
24. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
25. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
26. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
27. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
28. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
29. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
30. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
31. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
32. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
33. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data on concrete materials and curing compounds.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Sustainable Sites Certificates:
      a. Certify paving materials solar reflectance index.
   2. Materials Resources Certificates:
      a. Certify recycled material content for recycled content products.
      b. Certify source for local and regional materials and distance from Project site.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with [ACI 301.] [requirements of [Section 03 10 00,] [Section 03 20 00,] and [Section 03 30 00].]

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with City of Madison standard.

D. Maintain one copy of document on site.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place concrete when base surface temperature is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Form Materials: As specified in Section 03 10 00.

B. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick.

2.2 REINFORCING

A. Reinforcing Steel and Wire Fabric: Type specified in Section 03 20 00..

B. Deformed Reinforcing: Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, [galvanized] [uncoated] [epoxy coated] finish.

C. Deformed Bar Mats: ASTM A184/A184M; fabricated from ASTM A615/A615M ASTM A706/A706M 60 ksi yield strength, steel bars, epoxy coated finish.

2.3 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 30 00

B. Provide in accordance with City of Madison standards.

C. Concrete Reinforcing Fibers: ASTM C1116, high strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete.

D. Water: ASTM C94/C94M; potable, [without deleterious amounts of chloride ions.

E. Air Entrainment: ASTM C260.

2.4 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1.

B. Membrane Curing Compound: ASTM C1315 Type I, Class A.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94/C94M, Option A.

B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.

C. Use accelerating admixtures in cold weather only when approved by the Architect/Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

D. Use calcium chloride only when approved by the Architect/Engineer in writing.

E. Use set retarding admixtures during hot weather only when approved by the Architect/Engineer in writing.

2.6 SHOP FINISHING - REINFORCING

A. Epoxy Coated Finish for Steel Bars: ASTM A775/A775M.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Provide mix design.

B. Submit proposed mix design to appointed firm for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade subbase is dry and ready to support paving and imposed loads.
   1. Proof roll subbase with tri-axle truck (min. 20 ton load) to identify soft spots.

2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

C. Verify gradients and elevations of base are correct.

3.2 BASE COURSE

A. Prepare base course in accordance with City of Madison standards.

3.3 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

B. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

A. Place and secure forms and screeds to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.5 REINFORCING

A. Place reinforcing as indicated on Drawings.

B. Interrupt reinforcing at contraction / expansion joints.

C. Place reinforcing to achieve paving and curb alignment as detailed.

3.6 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Place concrete in accordance with City of Madison standards.

3.7 JOINTS

A. Place joints at regular intervals. Align curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances.

C. Provide joints per City of Madison standards.

3.8 FINISHING

A. Paving: Light broom.

B. Sidewalk Paving:Light broom, radius to 1/4 inch radius, and trowel joint edges.

C. Curbs and Gutters:Light broom.

D. Direction of Texturing: Transverse to paving direction.

E. Inclined Vehicular Ramps: Broomed perpendicular to slope.

F. Place curing compound on exposed concrete surfaces immediately after finishing.

3.9 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces in accordance with City of Madison standards.

3.10 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Perform field inspection and testing in accordance with City of Madison standards.

C. Inspect reinforcing placement for size, spacing, location, support.

D. Testing firm will take cylinders and perform slump [and air entrainment] tests in accordance with ACI 301.

E. Strength Test Samples:
1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, field cured.
3. Sample concrete and make one set of three cylinders for every 150cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area paving.
4. Make one additional cylinder during cold weather concreting, and field cure.

F. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

G. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39/C39M.
2. Test Acceptance: In accordance with City of Madison standards.

H. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

1 END OF SECTION

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SECTION 32 91 13

SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparation of subsoil.
   2. Soil testing.
   3. Placing topsoil.

B. Related Sections:
   1. Section 31 23 17 - Trenching: Rough grading over cut.
   2. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
   3. Section 32 93 00 - Plants.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

1.3 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Materials Resources Certificates:
      a. Certify source for regional materials and distance from Project site.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with City of Madison standard.

B. Maintain **one copy** of each document on site.

1.5 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate with installation of underground sprinkler system piping and watering heads.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design compliance.

B. Materials and Resources Characteristics:
   1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site .

2.2 SOIL MATERIALS

A. Topsoil: As specified in Section 32 05 13.

2.3 ACCESSORIES

A. Edging: **Galvanized steel**.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

END OF SECTION

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SECTION 32 93 00

PLANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Trees.
2. Mulch.
3. Fertilizer.
4. Pruning.
5. Maintenance.
6. Section 31 05 13 Soils for Earthwork
7. Section 32 84 00 - Planting Irrigation.
8. Section 32 92 19 - Seeding.

B. Allowances: Include under provisions of Section 01 20 00 - Price and Payment Procedures. Allowance includes furnishing of trees. Installation is included in this section and is part of Contract Sum/Price for furnishing and installing of trees.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
2. ANSI Z60.1 - Nursery Stock.

B. Forest Stewardship Council:
1. FSC Guidelines - Forest Stewardship Council Guidelines.

C. Village of DeForest Tree/Shrub Species Recommendations and Prohibitions List

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Plant and Material Certifications:
1. Certificates of inspection as required by governmental authorities.

C. Product Literature and Samples:
1. Weed barrier fabric. 4-inch square minimum sample.

2. Peat humus -no sample required.
3. Fertilizer packets.
4. Stone mulch sample – minimum 5 lbs. in container.

D. Plant Label Data: Data substantiating that trees and shrubs and planting materials comply with specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Include pruning objectives, types and methods.

1.6 QUALITY ASSURANCE

A. Tree Pruning: ANSI A300 Pruning Standards for Woody Plants.

B. Perform Work in accordance with Village of DeForest Forestry standard.

C. Landscape work shall be done by a single firm specializing in landscape work.

D. Source Quality Control:
1. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Engineer, together with proposal for use of equivalent material.
2. Plants: Provide plants of quantity, size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.
3. Labeling: Label each tree and shrub with securely attached waterproof tag bearing legible designation of botanical and common name (no exceptions).
4. Inspection: The Engineer may inspect plants either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size, and quality. Engineer retains right to further inspect plants for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected plants immediately from project site.

1.7 QUALIFICATIONS

A. Nursery: Company specializing in growing and cultivating plants with three years documented experience.

B. Installer: Company specializing in installing and planting plants with three years documented experience.

C. Maintenance Services: Performed by installer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Trees, Shrubs, and Plants: Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Engineer. Do not bend or bind-tie in such manner as to damage bark, break branches, or destroy natural shape. Handle balled and burlapped stock by the root ball only. Do not drop balled and burlapped stock during delivery. No balled and burlapped plant shall be planted if the ball is cracked or broken, unless approved by the Engineer.
   1. Spray anti-desiccant on deciduous trees and shrubs just prior to transport.
   2. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
   3. Deliver trees, shrubs, and plants after preparations for planting have been completed and plant immediately. In healing in, all bundles must be opened and the plants separated before the roots are covered, and care shall be taken that no air pockets remain among the roots.
   4. Do not remove container-grown stock from containers until planting time.
   5. Protect and maintain plant life until planted.
   6. If planting is delayed more than 6 hours after delivery, set plants in shade, protect from weather and mechanical damage, and keep roots moist with mulch covering, burlap or other acceptable means of retaining moisture.
   7. Water root systems of trees, shrubs, and plants stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.
   8. Plant material damaged as a result of delivery, storage or handling will be rejected.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate with Engineer and Village Staff prior to ordering trees.

C. Provide a minimum of 24 hours notice prior to planting any trees.

1.10 PROJECT CONDITIONS

A. Existing Conditions: Contractor shall be held to have visited the site, be familiar with the existing conditions and made due allowance for them in a proposal.

B. Utilities: Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

C. Detrimental Conditions: When conditions detrimental to plant, seed, or sod growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Engineer before attempting to plant.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

C. Special Warranty: Warrant all plants for a period of one full growing season after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal

weather conditions unusual for warranty period, or incidents which are beyond Landscape Installer's control.

D. Replacement: Remove and replace plants found to be dead or in unhealthy condition immediately during warranty period unless required to plant in the succeeding planting season.

E. Warranty inspection will be conducted at end of warranty period to determine acceptance or rejection.

F. Replace plants and other material which are 25% or more dead or in an unhealthy condition at end of warranty period.

G. Only one replacement of each plant will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.

1.12 SEQUENCING AND SCHEDULING

A. Plant or install materials during normal planting seasons for each type of material required or as approved by Engineer.

B. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

C. Coordination with Seeded or Sodded Areas: Plant shrubs after final grades are established and prior to seeding or sodding unless otherwise acceptable to the Engineer. If planting of shrubs occurs after seeding or sodding, contractor shall be responsible for protection of these areas and for promptly repairing any damage caused by planting operations.

1.13 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintain plant life immediately after placement until plants are well established and exhibit vigorous growing condition. Continue maintenance until termination of warranty period.

C. Maintenance includes:
1. Cultivation and weeding plant beds and tree pits.
2. Applying herbicides for weed control. Remedy damage resulting from use of herbicides.
3. Remedy damage from use of insecticides.
4. Trees and Shrubs are to be watered for 10 days following planting by the Landscape Contractor. Watering shall be required daily in hot dry weather. This requirement shall be at the discretion of the Engineer.
5. Pruning, including removal of dead or broken branches.
6. Disease control.
7. Maintaining wrapping, guys, and stakes. Repair or replace accessories when required.
8. Replacement of mulch.

PART 2 PRODUCTS

2.1 TREES, PLANTS, AND GROUND COVER

A. Deciduous Trees
   1. Species: In accordance with Standardized Plant Names, official code of American Joint Committee on Horticulture Nomenclature.
   2. Identification: Label individual plants or each bundle of plants when tied in bundles.
   3. Plants: No. 1 Grade conforming to “American Standard for Nursery Stock” of American Association of Nurserymen (AAN); well-branched, vigorous and balanced root and top growth; free from disease, injurious insects, mechanical wounds, broken branches, decay and other defects.
   4. Trees: Furnish with reasonably straight trunks, well balanced tops, and single leader.
   5. Deciduous plants: Furnish in dormant state, except those specified as container grown.
   6. Trees must comply to ANSI Z60.1-1996 “American Standard for Nursery Stock” or most recent version thereof.
   7. Trees to be a minimum 2” caliper.
   8. Privide balled and burlapped (B&B)
   9. Trees used include one of each species listed below or multiple trees from any one of the species listed.

B. Deciduous Shrubs: Provide shrubs of the size listed and with not less than the minimum number of canes required by ANSI Z60.1 for the type and size.
   1. Provide container grown (to 24-inch size).
   2. Balled and burlapped will be acceptable in lieu of container stock subject to ANSI Z60.1 requirements.

C. Conifers: Provide conifers of size listed. Normal-quality, well balanced, coniferous evergreens conforming to ANSI Z60.1
   1. Provide container grown (to 4-foot height).
   2. Balled and burlapped will be acceptable in lieu of container stock subject to ANSI Z60.1 requirements.

D. Perennials: Provide vigorous growing perennials established and well rooted in removable containers or integral peat pots, 2nd year plants or better.

E. Trees Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.

2.2 MULCH MATERIALS

A. Mulching Material: Shredded bark, wood chips, peat moss, or other Engineer accepted suitable material, that is substantially free of noxious weed seeds and objectionable foreign material. Wood chips, if used, shall be obtained from any standard wood or brush-chipping machine. Contractor shall obtain the Engineer’s approval for the type of mulch used.

2.3 SOIL AMENDMENTS

A. Peat Humus: Finely divided or granular texture with a pH range of 6.0 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.

B. Water: Potable.

2.4 FERTILIZER

A. A. Slow-Release Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For Shrubs: Provide time release fertilizer packets with not less than 10 percent total nitrogen, 5 percent available phosphoric acid, and 15 percent soluble potash, 5-year time release.
2. For Trees: Provide time release fertilizer packets with not less than 16 percent total nitrogen, 8 percent available phosphoric acid, and 16 percent soluble potash, 5-year time release.

2.5 ACCESSORIES

A. Anti-Erosion Mulch for Restoration Seed Areas: Provide clean, shredded seed-free salt hay or threshed straw of wheat, rye, oats, or barley.

B. Organic Landscaping Mulch: Shredded Bark or Hardwood (except Walnut) mulch free from deleterious materials and suitable for top dressing around shrubs and perennials

C. Mineral Mulch: Landscaping stone. Washed, clean, rounded river gravel or smooth-faced stone, with natural gray color range. Size range 1-1/2” to 2” diameter.

D. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration, but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer’s instructions.

E. Weed Barrier Fabric: Water permeable filtration fabric of non-woven polypropylene or polyester fabric.
1. Mirafi Mirascape (gray) or equivalent

F. Wrapping Materials: Burlap

G. Stakes: Softwood lumber.

H. Cable, Wire, Eye Bolts, Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

I. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Saturate soil with water to test drainage.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Planting Layout: Lay out individual tree, shrub, and perennial locations for multiple plantings. Secure Engineer's approval before planting. Make minor adjustments as may be required.

C. Planting Soil Mixture: 3 parts topsoil to 1 part peat humus or manure. Amend as required to maintain specified pH range.

D. Planting Beds:
1. Loosen subgrade to a minimum depth of 8 inches using a roto-tiller or similar equipment. Remove stones measuring over 1½ inches in any dimension. Remove sticks, stones, rubbish, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
2. Spread topsoil to a minimum depth of 4 inches and as required to meet lines, grades, and elevations shown, after light rolling, and natural settlement.
a. Place approximately one-half (½) of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer, then place remainder of topsoil. *(Not required if very porous/sandy subsoil)*
b. Do not spread if soil or subgrade is frozen.

E. Excavation for Trees and Shrubs: Excavate pits, beds, and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.
1. For container-grown stock, excavate to at least container width and depth, plus allow for 3-inch thick setting layer of planting soil mixture.
2. For balled and burlapped (B&B) trees and shrubs, make excavations at least 1.5 times as wide as the ball diameter and equal to the ball depth, plus allow for 3 inch thick setting layer of planting soil mixture.
3. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.

3.3 FERTILIZING

A. Apply starter fertilizer at the rate recommended by the nursery.

B. Apply after initial raking of topsoil.

C. Lightly water soil to aid dissipation of fertilizer.

3.4 PLANTING

A. Place plants for best appearance for review and final orientation by Engineer and Village staff.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Place bare root plant materials so roots lie in natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

E. Saturate soil with water when pit or bed is half full of topsoil and again when full.

3.5 PLANTING SHRUBS

A. Balled and Burlapped (B&B):

1. Set B&B stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades.
2. Remove burlap from sides of balls; retain on bottoms.
3. When set, place additional backfill in layers around base and sides of ball, tamping to settle backfill and eliminate voids and air pockets.
4. When excavation is approximately 1/2 full, water thoroughly before placing remainder of backfill.
5. Place fertilizer packets minimum 8-inches below surface, equally spaced, one packet per shrub and then place remainder of backfill.
6. Water again after placing final layer of backfill. Dish top of backfill to allow for watering.

B. Container: Set container grown stock, as specified, for balled and burlapped stock, except carefully and completely remove containers so as not to damage root balls. See plans for graphic details.

C. Anti-desiccant Spraying: If deciduous trees or shrubs are moved when in full-leaf, spray with anti-desiccant at nursery before moving and spray again 2 weeks after planting. Apply anti-desiccant, using power spray, to provide an adequate film over trunks, branches, stems, twigs and foliage.

D. Pruning:

1. Unless otherwise directed by Engineer, remove only injured or dead branches, prune to retain natural character, do not cut leaders. Prune according to standard horticultural practice.
2. Trees and Shrub sizes indicated are sizes after pruning.
3. Remove and replace excessively pruned or mis-formed stock resulting from improper pruning.

3.4 PLANTING PERENNIALS

A. Planting:

1. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
2. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

B. Watering: Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.5 MULCHING

A. Mulching planting beds: Provide not less than the following thickness of mulch over a continuous layer of weed barrier fabric, and work into top of backfill and finish level with adjacent finish grades.

1. Overlap weed-barrier fabric edges a minimum of 6 inches
2. Provide 4 inches thickness of organic mulch.

B. Mulching around trees: Provide not less than the following thickness of mulch:

1. Provide 4 inches thickness of organic mulch.

C. Mulching utility areas as indicated: Provide not less than the following thickness of mulch

over a continuous layer of weed barrier fabric and finish level with adjacent finish grades.

1. Overlap weed-barrier fabric edges a minimum of 6 inches
2. Provide 3 inches thickness of mineral mulch.

D. Edging: Provide edge cuts around perimeter of planting and utility beds 5-6 inches deep and extending to the interior of the bed at an approximately 45-degree angle to minimize lawn encroachment. Mulch to be backfilled even with rest of bed.

PART 4

4.1 PLANT RELOCATION AND RE-PLANTING

A. Relocate plants as directed by Engineer.

B. Ball or pot removed plants when temporary relocation is required.

4.2 INSTALLATION OF ACCESSORIES

A. Wrap deciduous shade and flowering tree trunks and place tree protectors.

4.3 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:

Tree Caliper	Tree Support Method
1 inch	1 stake with one tie
1 - 2 inches	2 stakes with two ties
2 - 4 inches	3 guy wires with eye bolts and turn buckles
Over 4 inches	4 guy wires with eye bolts and turn buckles

4.4 TREE PRUNING

A. When pruning trees is required, lightly prune trees in accordance with ANSI A300 Maintenance Pruning Type: Crown Cleaning.

4.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

4.6 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition. As soon as possible following completion of work in a specific area or phase, excess materials, equipment, rubbish, debris, barricades, signs, etc. shall be removed from area.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

C. Equipment shall at no time be stored or parked on private property without written permission of the property owner. At the conclusion of the workday equipment may be parked on the project site or at such other location for which the contractor has made arrangements.

D. All excess materials and/or debris shall be disposed of in a manner, and only at such locations, as are designated for that purpose.

4.7 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, Engineer will make an inspection to determine acceptability. Landscape work may be inspected for acceptance in portions as agreeable to Engineer, provided each portion of work offered for inspection is complete, including maintenance.

B. When inspected landscape work does not comply with requirements, replace rejected work, and continue specified maintenance until re-inspected by Engineer and found to be acceptable. Remove rejected plants and materials promptly from project site.

4.8 SCHEDULE

A. Plant Schedule:

1. Identified on Plans.

END OF SECTION

SECTION 33 11 13

PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for public line including potable water line, and fire water line.
2. Tapping Sleeves and Valves.
3. Valves and Fire Hydrants.
4. Bedding and cover materials.
5. Abandon Existing Watermain.

B. Related Requirements:
1. Section 03 30 00 - Cast-In-Place Concrete: Concrete for thrust restraints.
2. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
3. Section 31 23 16 -Earthwork: Product and execution requirements for excavation and backfill required by this section.
4. Section 31 23 17 – Trenching and Backfilling: Execution requirements for trenching required by this section.
5. Section 33 05 14 - Public Manholes and Structures.
6. Section 33 12 13 - Water Service Connections
7. Section 33 12 16 - Water Utility Distribution Valves.
8. Section 33 12 19 - Water Utility Distribution Fire Hydrants.
9. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of water piping.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

C. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:
1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm), for Water.
4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
7. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
8. AWWA C200 - Steel Water Pipe 6 In. (150 mm) and Larger.
9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied.
11. AWWA C206 - Field Welding of Steel Water Pipe.
12. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
14. AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
15. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
16. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
17. AWWA C500 - Gate Valves for Water and Sewage Systems.
18. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
19. AWWA C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
20. AWWA C606 - Grooved and Shouldered Joints.
21. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
22. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
23. AWWA C702 - Cold-Water Meters - Compound Type.
24. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
25. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm Through 300 mm), for Water Distribution.
26. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 36 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
27. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. Manufacturer's Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Agency:
1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Shop Drawings: Indicate piping layout, including piping specialties.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Test reports as specified in this section.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Valves: Mark valve body with manufacturer's name and pressure rating.

B. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction.

C. Comply with requirements of water utility. Include tapping of water mains and backflow prevention.

D. Comply with standards of authorities having jurisdiction for fire protection systems. Include materials, hose threads, installation, and testing.

E. Fusible polyvinylechloride pipe:
1. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.
2. Fusion Technician shall be fully qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.
3. Fusible polyvinylchloride pipe shall be used as manufactured under the trade names Fusible C-900®, Fusible C-905®, and FPVC®, for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051. Owner and engineer are aware of no other

supplier of fusible polyvinylchloride pipe that is an equal to this specified pipe supplier and products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place.

C. Block individual and stockpiled pipe lengths to prevent moving.

D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

E. Store polyethylene materials out of sunlight.

1.7 EXISTING CONDITIONS

A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Water main pipe shall conform to Chapter 8.18.0 of the State of Wisconsin Standard Specifications for Sewer and Water Construction, Latest Edition.

B. Ductile Iron Pipe: AWWA C151. Bituminous outside coating: AWWA C151. Pipe Mortar Lining: AWWA C104, double thickness. Polyethylene Encasement: AWWA C105.
   1. Pipe Class: AWWA C151, Class 52 Ductile Iron Pipe
   2. Pipe Marking: Weight, class or nominal thickness, and casting period shall be shown on each pipe. Manufacturer's mark, the year in which the pipe was produced, and the letters "DI" or the word "Ductile" shall be cast or stamped on the pipe.
   3. Fittings: Ductile iron, AWWA C110. Compact fittings AWWA C153.
      a. Coating and Lining:
         1) Bituminous Coating: AWWA C110.
         2) Cement Mortar Lining: AWWA C104, double thickness.
      b. Lugged Retainer Glands: Approved mechanical joint lugged retainer glands (Mega Lug or equal) may be used with ductile iron or polyvinyl chloride pressure pipe.
   4. Joints:
      a. Mechanical and Push-On Joints: AWWA C111.
      b. Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal.

C. Fusible Polyvinylchloride Pipe:

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:
   1. Manufacturer and Product List:
      a. Kennedy Valve Co.

b. Mueller Co.

B. Tapping Valves:
1. Manufacturer and Product List:
a. Kennedy Valve Co.
b. Mueller Co.

2.3 VALVES AND FIRE HYDRANTS

A. Valves: Conform to Section 33 12 16.

B. Fire Hydrants: Conform to Section 33 12 19.

2.4 ANCHORING

A. Metal tie rods and clamps or lugs: Galvanized steel sized in accordance with NFPA 24 thoroughly coated with bituminous paint.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: Type 3 Embedment as specified in Section 31 23 17.

B. Cover: Type 3 Embedment as specified in Section 31 23 17.

C. Soil Backfill from Above Pipe to Finish Grade: Native backfill as specified in Section 31 05 13. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.6 FINISHES

A. Steel: Galvanizing, ASTM A123/A123M; hot dip galvanize after fabrication.

2.7 ACCESSORIES

A. Concrete for Thrust Restraints: Conform to Section 03 30 00. Wood blocking is not allowed.

B. Manhole and Cover: Conform to Section 33 05 14.

C. Steel rods, bolt, lugs and brackets: ASTM A36/A36M or ASTM A307 Grade A carbon steel.

D. Protective Coating: Bituminous coating.

E. Electrical conductivity across joints and fittings shall be provided according to the manufacturer's recommendations. Conductivity devices may be cable bond type or a copper conductivity strip. Either shall be capable of carrying 500 amperes continuously. Metal wedges are not permitted. Lead-tipped rubber gaskets or lead-caulked joints are not permitted.

F. For fittings and shortened pipe sections where cable bond type or copper conductivity type continuity devices are not provided by the manufacturer the Contractor shall field weld a lug onto the fitting, hydrant, valve or shortened pipe section and shall field install a strip or cable capable of carrying 500 amperes continuously between the sections. Cable bonds or copper conductivity strips can be installed around such fittings, valves or shortened pipe sections; but hydrants shall be equipped with continuity devices.

2.8 TRACER WIRE

A. Tracer Wire shall be ten (10) gauge (AWG) single strand copper wire with 60 mil of black, cross-linked polyethylene (XLPE) insulation specifically manufactured for direct burial applications.

2.9 STYROFOAM INSULATION

A. Provide 4'x8'x2" sheets of polystyrene insulation board that conforms to the requirements for Extruded Insulation Board, AASHTO Designation M230, except remove the flammability requirement.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Pre-Construction Site Photos:
   1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
   2. Show mail boxes, curbing, lawns, driveways, signs, culverts, and other existing site features.
   3. Include project description, date taken and sequential number on back of each photograph.

C. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

C. Provide sheeting and shoring in accordance with Section 31 23 17.

D. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

3.4 INSTALLATION - PIPE

A. Install pipe in accordance with AWWA C600.

B. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on Drawings.

C. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

D. Maintain 8 ft horizontal separation of water main from sewer piping and where water mains cross over sewers, maintain 6 inches minimum vertical separation and where water mains cross under sewers, maintain 18 inches minimum vertical separation in accordance with NR 811 code.

E. Cutting of Existing Mains: The Water Utility will operate all distribution system valves. The Contractor shall cut the water main, remove any plugs or caps, and pump the water out of the trench caused by cutting of the main or removal of the plugs or caps. All excavations required shall be made by the Contractor.

F. Install pipe to indicated elevation to within tolerance of 5/8 inches. Piping shall have a minimum cover of 6-1/2 feet below finished grade unless otherwise indicated.

G. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds 2 feet of rise per one hundred feet of trench, the bells shall face upgrade.

H. Line and Grade for Open-cut Construction: The Engineer will establish the centerline, locate changes in alignment, hydrant locations, and reference elevations at suitable intervals. The Contractor shall, at his own expense, furnish the necessary equipment and technical personnel to transfer the alignments and grades from stakes to the water main location. The Contractor shall check the alignment and grade of the water main at each staked station, or as directed by the Engineer. If it is determined that any or all water main is not installed in conformance with the staked plan or alignments and grades, the Contractor shall make the necessary corrections at his expense.

I. Obstructions in Line or Grade: Whenever it becomes necessary to lay a main over, under, or around a known obstruction and so shown on the plans, the Contractor shall furnish and install the required fittings. The laying of such fittings will considered incidental to the lineal foot of water main, unless accounted for on the bid form. No additional compensation will be paid to the Contractor for any expenses incurred because of such obstruction.

J. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. Precautions shall be taken to prevent foreign materials from entering the joint space and the joint recess shall be carefully checked for foreign material before the gasket is installed.

K. The pipe shall be secured in place with bedding material, placed by hand or equally careful means, keeping the bell end open. Pipe and fittings, which do not allow a sufficient and uniform space for joints, shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space.

L. Protection of Open Pipe: At all times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall

remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when in the opinion of the Engineer, trench conditions are unsuitable.

M. Cleaning of Pipe: The interior and exterior of all pipe shall be clean and free from all foreign material before being installed. The Contractor shall provide the necessary means to wipe, brush, swab or air blast to remove any foreign material from the interior of the pipe as directed by the Engineer.

N. Install ductile iron piping and fittings to AWWA C600.

O. Install Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standards.

P. Contractor shall have sufficient supplies on site to plan for varying conditions that will be encountered. Contractor shall coordinate with local businesses and residents to prepare for planned water shut-off's. If necessary for business or health considerations, Contractor shall provide temporary water services.

Q. Contractor shall obtain a safe water sample prior to acceptance of the new main.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Install valves in accordance with Section 33 12 16.

B. Install hydrants in accordance with Section 33 12 19.

3.6 INSTALLATION - TAPPING SLEEVES AND VALVES

A. Install tapping sleeves and valves in accordance with shop drawings and in accordance with manufacturer's instructions.

3.7 THRUST RESTRAINT

A. All mechanical joint fittings are to be restrained by thrust restraint retainer glands (Mega Lug or approved equal). This includes but is not limited to valves, tees, bends, caps, and plugs. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair. Provide sq ft thrust restraint bearing on subsoil. Thrust restraint shall be provided for all joints within 30 feet of the above items.

B. Install tie rods, clamps, set screw retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.

C. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.

3.8 SERVICE CONNECTIONS

A. Install service connections in accordance with Section 33 12 13.

3.9 ABANDON EXISTING WATER MAIN

A. Water mains shall be excavated and removed if it conflicts with new underground utilities or at the

locations indicated on the plans. These mains shall be disposed of off-site. If not otherwise noted, existing mains may be plugged and abandoned in place.

B. All abandoned water mains shall be capped with a mechanical joint cap connected to the pipe end with a mega-lug or bolted to the flange of existing tees where applicable.

C. Caps shall be adequately blocked with solid concrete blocking or a poured concrete buttress.

D. Existing water valves to be abandoned shall be closed. The top section of the valve box shall be removed, and the remainder of the valve box shall be filled with 3/8” to 1” diameter clear stone.

E. No utilities shall be abandoned until new utilities are fully operational and have passed the testing requirements.

F. Fire hydrants shall be removed and salvaged to the Owner.

3.10 STYROFOAM INSULATION

A. Place 4’x8’x2” sheets of polystyrene insulation board where storm sewer crosses over water mains or laterals as indicated on the plans.

B. Prior to placement of polystyrene boards, bedding material shall be placed to a height of 6-12 inches over the top of the pipe, leveled, and compacted.

C. The insulating boards shall be placed on the cover material with the long side parallel to the centerline of the water main for a minimum width of 48". The boards shall be placed in a staggered arrangement so as to eliminate continuous transverse joints. If two or more layers of insulation board are used, each layer should be placed so as to cover the joints of the layer immediately below.

D. The first lift of backfill material shall consist of 6-inches of bedding material which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. This layer shall be compacted with equipment that exerts a contact stress of 70 to 80 psi. Once this layer has been compacted to the specified density, the remaining layers of backfill may be constructed utilizing conventional procedures.

3.11 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water main and services as needed to maintain specified conditions for construction operations. Notify with Owner and affected property owners a minimum of 48 hours in advance of any water service shut off. Provide temporary ramping at driveways, intersections and sidewalks as necessary to protect temporary water main and service from vehicular and pedestrian traffic. Maintain temporary ramping until the new water main and services are installed and operational and the temporary water items have been removed. Connect to existing water source. Coordinate with Owner for metering water usage.

3.12 BACKFILLING

A. Backfill pipe in accordance with Section 31 23 17.

3.13 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.14 FIELD QUALITY CONTROL

A. Tests Required: The Contractor shall conduct hydrostatic pressure and leakage tests under the supervision of the Owner or Engineer. Slip joint ductile iron water main shall be tested for electrical conductivity in a manner approved by the Engineer. The Contractor shall furnish all equipment and labor for the tests.

B. Pressure test system in accordance with AWWA C600 and the following:

1. Test Pressure: Not less than 150 psi or 50 psi in excess of maximum static pressure, whichever is greater.
2. Test pressure shall not exceed pipe or thrust-restraint design pressures.
3. Conduct hydrostatic test for at least two-hour duration.
4. Each valved section of pipe shall be slowly filled with water, and the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.
5. Air Removal: Before applying the specified test pressure, air shall be expelled completely from the section of piping under test.
6. Examination: All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.
7. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
8. Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
9. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

10. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.
11. Acceptance of Installation. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified by the above

formula, repairs or replacements shall be accomplished in accordance with the specifications.

C. Compaction Testing for Bedding: In accordance with ASTM D1557 if required by Engineer.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Tests: one test per 500 feet of trench for each 2 foot lift if required by the Engineer.

END OF SECTION

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SECTION 33 31 13

PUBLIC SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer pipe and fittings.
2. Underground pipe markers.
3. Connection to existing manholes.
4. Manholes.
5. Wye branches and tees.
6. Sanitary Laterals.
7. Bedding and cover materials.
8. Abandon Existing Sanitary Sewer

B. Related Sections:
1. Section 03 20 00 - Concrete Reinforcing.
2. Section 03 30 00 - Cast-In-Place Concrete: Concrete type for manhole base pad construction.
3. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
4. Section 31 23 16 -Earthwork: Product and execution requirements for excavation and backfill required by this section.
5. Section 31 23 17 – Trenching and Backfilling: Execution requirements for trenching required by this section.
6. Section 33 01 32 - Sewer and Manhole Testing.: Pressure, infiltration, and deflection tests.
7. Section 33 05 14 - Public Manholes and Structures: Concrete manholes, frames and grates for sanitary sewer.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
6. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
7. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

8. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
9. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
10. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
13. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
14. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
15. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
16. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
17. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
18. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
19. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
20. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
21. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C150 - ANSI Standard for the Thickness Design of Ductile Iron Pipe.
6. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.

D. National Fire Protection Association:
1. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product data and shop drawings: Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.

C. Submit reports indicating field tests made and results obtained.

D. Manufacturer's Installation Instructions:
   1. Indicate special procedures required to install Products specified.
   2. Submit detailed description of procedures for connecting new sewer to existing sewer line and directional drilling pipe jacking installation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standard.

B. Sanitary laterals shall be installed in conformance with the Department of Commerce Plumbing Code and any local plumbing codes and regulations.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section.

B. Installer: Company specializing in performing work of this section.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place

C. Block individual and stockpiled pipe lengths to prevent moving.

1.9 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate the Work with Municipality of authority having jurisdiction.

C. Notify affected utility companies minimum of 72 hours prior to construction.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPE AND FITTINGS

A. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of inches, bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

2.2 FLEXIBLE COUPLINGS

A. Manufacturers:
   1. Fernco.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Flexible Coupling: Resilient chemical-resistant elastomeric polyvinyl chloride (PVC) coupling, two Series 300 stainless steel clamps and stainless steel screws and housings.

2.3 FLEXIBLE PIPE BOOT FOR MANHOLE PIPE ENTRANCES

A. Manufacturers:
   1. Lock Joint Flexible Manhole Sleeve, Inc. Model.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Flexible Pipe Boot: ASTM C923, ethylene propylene rubber (EPDM), Series 300 stainless steel clamp and stainless steel hardware.

2.4 MANHOLES

A. Manholes: As specified in Section 33 05 14; precast concrete, 48 inch diameter, eccentric conical top, water tight cast iron frames and covers.

2.5 BEDDING AND COVER MATERIALS

A. Bedding and Cover: Class C bedding as specified in Section 31 23 17 and as shown in the detail.

B. Soil Backfill from Above Pipe to Finish Grade: Native backfill or select granular backfill as specified in Section 31 23 17. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.6 ACCESSORIES

A. Grout: Specified in Section 03 60 00. 04 05 03.

B. Cellular concrete shall meet the following specifications: 1 part cement, 1 part fly ash, and 8 parts sand or an approved equal and water. Cement shall meet the requirements of Subsection 501.3.2 of the Standard Specifications for Type 1 Portland Cement. Sand shall meet the requirements of Subsection 501.3.6.3 of the Standard Specifications. Water shall meet the requirements of Subsection of 501.3.5 of the Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trench cut excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Correct over excavation with coarse aggregate.

B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

C. Protect and support existing sewer lines, utilities and appurtenances.

D. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17.

B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.

C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

D. Provide sheeting and shoring in accordance with Section 31 23 17.

E. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Lay pipe to slope gradients noted on layout drawings. Begin at downstream end and progress upstream.

C. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Architect/Engineer.

D. Keep pipe and fittings clean until work is completed and accepted by Architect/Engineer. Cap open ends during periods of work stoppage.

E. Lay bell and spigot pipe with bells upstream.

F. Connect pipe to existing sewer system as noted. Connecting to existing sewer shall be incidental to new main unless otherwise indicated on the bid form.

G. When replacing existing sewer, the existing sanitary sewer shall be excavated and removed as construction occurs. The new sewer shall be connected to the existing sewer at the end of each workday. Raw sewage shall not be allowed to run into the trench. Pumping sewage between manholes will be required.

H. Install trace wire continuous over top of pipe when shown on the plans or bid form.

3.5 INSTALLATION - CONNECTION TO EXISTING MANHOLE

A. Core drill existing manhole to clean opening. Using pneumatic hammers, chipping guns, sledge hammers, is not permitted.

B. Connection to existing manholes shall be made with a watertight KOR-N-SEAL boot.

C. Prevent construction debris from entering existing sewer line when making connection.

3.6 INSTALLATION - MANHOLES

A. Install manholes in accordance with Section 33 05 14.

3.7 INSTALLATION - WYE BRANCHES AND TEES

A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.

B. Maintain minimum 5 feet separation distance between wye connection and manhole.

C. Use saddle wye or tee with stainless steel clamps for taps into existing piping. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with template and cut holes with mechanical cutter. Clamp on wye branches shall not be permitted.

3.8 INSTALLATION - SANITARY LATERALS

A. Construct laterals from wye branch to terminal point at right-of-way or as shown on the plans or as directed by the Engineer.

B. Where depth of main pipeline warrants, construct riser type laterals from wye branch.

C. Maintain 8 feet minimum depth of cover over pipe unless connecting to existing laterals with less cover.

D. Maintain minimum 5 feet separation distance between laterals.

E. Lateral cards provided by Engineer must be completed by Contractor for each lateral.

F. It is the responsibility of the contractor to identify and reconnect all existing live laterals.

G. Sewer and water services may be placed in a common trench if installed concurrently. If not installed concurrently, a minimum 10-foot horizontal separation must be maintained between the sewer and water services.

H. The minimum size sewer service shall be 4-inches in diameter. Sewer service size and class shall be as specified in the Contract Documents.

I. The alignment of a sewer service shall be straight extending from the spur or socket of the main sewer in a direction at right angles to the main sewer to the lot line or as specified on the plans. When the sewer service cannot be constructed as noted above, the Contractor shall install a marker at the end of the sewer service and shall notify the Owner of this condition.

J. Sanitary sewer services shall have a slope of one-fourth inch per foot where possible. In no case shall the slope be less than one-eighth inch per foot. Between the lot line and the sewer main, or riser pipe, the sewer shall be laid at uniform slope not exceeding one-half inch per foot. Between the lot line and the building, the slope shall not exceed one-half inch per foot, except for a change in elevation, which shall be made by use of 45-degree fittings.

K. When not connecting to existing lateral, install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral.

L. All existing sewer services shall be reconnected with PVC SDR 35 pipe and a suitable Fernco coupling unless otherwise specified or directed by the Engineer.

M. Install tracer wire continuous over top of pipe when shown on the plans or bid form.

N. Contractor shall note the condition of the existing lateral beyond the reconnection point and notify the Engineer of the condition.

3.9 LOCATION OF EXISTING SEWER SERVICES

A. The Contractor will be furnished available recorded measurements for the location of existing sewer services. Evidence of existing trenches and any other pertinent evidence also shall be used in their location.

B. The Contractor is responsible for locating live laterals.

3.10 ABANDON EXISTING SANITARY MAINS & MANHOLES

A. All existing sewer mains shall be properly abandoned at all locations where the new sewer replaces the existing. The abandoned sewer pipe shall be plugged with cellular concrete in

accordance with the pertinent requirements of Section 204 of the Wisconsin Department of Transportation Standard Specifications and as directed by the engineer. The abandoned manholes shall have the walls removed at least 2 feet below subgrade within the roadbed and at least 2 feet below grade outside the roadbed. Fill remaining sections of manholes with acceptable fill material.

3.11 BACKFILLING

A. Backfill around sides and to top of pipe with cover fill in minimum lifts of 6 inches, tamp in place and compact to 95 percent. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.

3.12 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Pressure Test: Test in accordance with Section 33 01 32.

C. Infiltration Test: Test in accordance with Section 33 01 32.

D. Deflection Test: Test in accordance with Section 33 01 32.

E. Compaction Testing: In accordance with ASTM D1557 AASHTO T180 ASTM D2922 ASTM D3017.

F. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

G. Frequency of Compaction Tests: one test per 400 feet of trench per 2 foot lift.

3.13 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.14 SCHEDULE

END OF SECTION

SECTION 33 41 13

PUBLIC STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm drainage piping.
2. Accessories.
3. Drainage structures.
4. Bedding and cover materials.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete: Concrete type for catch basin manhole foundation slab construction.
2. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
3. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill required by this section.
4. Section 31 23 17 – Trenching and Backfilling: Execution requirements for trenching required by this section.
5. Section 31 23 19 - Dewatering
6. Section 33 05 14 - Public Manholes and Structures: Concrete manholes, frames and grates for storm drainage.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M36/M36M - Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
2. AASHTO M86 - Concrete, Sewer, Storm Drain, and Culvert Pipe.
3. AASHTO M170 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. AASHTO M196/M196M - Corrugated Aluminum Pipe for Sewers and Drains.
5. AASHTO M198 - Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
6. AASHTO M206 - Reinforced Concrete Arch Culvert Storm Drain, and Sewer Pipe.
7. AASHTO M207 - Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.
8. AASHTO M252 - Corrugated Polyethylene Drainage Tubing.
9. AASHTO M264 - Acrylonitrile-Butadiene-Styrene (ABS) and Poly Vinyl Chloride (PVC) Composite Sewer Piping.
10. AASHTO M278 - Class PS 50 Polyvinyl Chloride (PVC) Pipe.
11. AASHTO M288 - Geotextiles.
12. AASHTO M294 - Corrugated Polyethylene Pipe, 12- to 36-in Diameter.

B. ASTM International:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
3. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
6. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
7. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
8. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
9. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
10. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
11. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
12. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
13. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
14. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
15. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
16. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
17. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
18. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
19. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
20. ASTM F405 - Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
21. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
22. ASTM F667 - Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

1.3 SUBMITTALS

A. section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, manholes, inlets, catch basins, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section.

B. Installer: Company specializing in performing work of this section.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

D. Do not place pipe flat on ground. Cradle to prevent point stress.

E. Store UV sensitive materials out of direct sunlight.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate the Work with termination of storm sewer, trenching, connection to public storm sewer and installation of storm sewer with others working in the area.

C. Coordinate unrecorded or variations in site conditions, and corresponding adjustments to construction requirements.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Storm piping material shall be as indicated on the engineering drawings or bid form.

B. Reinforced Concrete Pipe (RCP): ASTM C76, inside nominal diameter as shown on the plans, bell and spigot ends.
   1. Reinforced concrete pipe shall conform to Sections 608 and 610 of the Wisconsin Department of Transportation Standard Specifications.
   2. Class
      a. All 12” reinforced concrete pipe (RCP) shall be Class IV
      b. All 15” RCP shall be Class IV
      c. All 18” RCP or larger shall be Class III
   3. Fittings: Reinforced concrete.
   4. Joints: ASTM C443 rubber compression gasket.

C. High Density Polyethylene Pipe (HDPE): AASHTO M252 (4”-10”), AASHTO M294 (12” and larger), corrugated Polyethylene Drainage Pipe, Type S, inside nominal diameter as shown on the plans, bell and spigot style rubber ring sealed gasket joint.
   1. High Density Polyethylene Pipe shall conform to Sections 530 of the Wisconsin Department of Transportation Standard Specifications.
   2. Fittings: Polyethylene.
   3. Joints: ASTM F-477, elastometric gaskets

D. Corrugated Metal Pipe (CMP): AASHTO M36; nominal diameter as shown on the plans.
   1. Corrugated Metal Pipe shall conform to Sections 520, 521 and 607 of the Wisconsin Department of Transportation Standard Specifications.
   2. Fittings: Corrugated steel.
   3. Joints: Corrugated steel pipe coupling bands, galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

E. Plastic Pipe (PVC): Diameter as shown on the plans.
   1. Diameter 4” to 15”: ASTM D 3034, SDR 35 unless otherwise indicated on the plans or Bid Form, bell and spigot style rubber ring sealed gasket joint.
   2. Diameter over 15”: ASTM F 679
   3. Fittings: PVC.
   4. Joints: ASTM F 477, elastomeric gaskets.

2.2 DRAINAGE STRUCTURES

A. Drainage Structures: Precast concrete, as specified in Section 33 05 14.
   1. Manholes: Diameter as shown on the plans, water tight, cast iron covers.
   2. Inlets: Shall be Type 3 (2’x3’) or concrete manholes as indicated on the plans, cast iron bicycle safe grate.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: Class B as specified in Section 31 23 17 and as shown in the detail.

B. Cover: Class B as specified in Section 31 23 17 and as shown in the detail.

C. Soil Backfill from Above Pipe to Finish Grade: Native backfill or select granular backfill as specified in Section 31 23 17. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings. Notify Engineer of discrepancies.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate.

B. Remove large stones and other hard or organic matter capable of damaging piping or impeding consistent backfilling or compacting.

C. Protect and support existing sewer lines, utilities and appurtenances.

D. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

3.3 EXCAVATION, BEDDING & BACKFILL

A. Excavate pipe trench in accordance with Section 31 23 17. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Backfill pipe trench in accordance with Section 31 23 17.

C. Dewater excavations to maintain dry conditions to preserve final grades at bottom of excavation.

D. Provide sheeting and shoring in accordance with Section 31 23 17.

E. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with the following:

B. ASTM D2321 for HDPE and PVC pipe and the ACPA Concrete Pipe Handbook for Concrete pipe. Seal joints watertight.

C. Place pipe on minimum 6 inch deep bed of Class B bedding as specified in Section 31 23 17.

D. Install piping beginning at low point of systems, true to grades and alignment indicated on the drawings with unbroken continuity of invert. Connect pipe to drainage structures. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

E. Line and Grade: The Engineer will establish the centerline, manholes, inlets, and reference elevations at suitable intervals. The Contractor shall, at his own expense, furnish the necessary equipment and technical personnel to transfer the alignments and grades from stakes to the sewer location. The Contractor shall check the alignment and grade of the sewer at each staked station, or as directed by the Engineer. If it is determined that any or all sewer is not installed in conformance with the staked or plan alignments and grades, the Contractor shall make the necessary corrections at his expense. When a new sewer is to be connected to an existing sewer not terminating in a manhole, the Contractor shall uncover the end of the existing sewer to allow any adjustments in line and grade to be made before any pipe is laid. Install top cover to minimum compacted thickness of 12 inches. Compact to 95 percent dry density by weight.

F. Alignment: All pipe shall be laid uniformly to line and grade so that the finished sewer will present a uniform bore. Noticeable variations from true alignment and grade will be considered sufficient cause for rejection of the work. All pipe to be laid in open-cut trench shall have 7-inch minimum clearance between the outside face of the pipe barrel and the face of the trench wall or sheathing.

G. Protection of Open Pipe: During all intermissions in construction of the sewer, the open face of the last pipe laid shall be covered or bulkheaded so as to prevent sand, water, earth, or other materials from entering the pipe. Fences shall be provided around all opening trenches whenever required for protection from the public.

H. Provide joint ties on storm sewer system infall and outfall pipes. Tie the last 3 sections or, if using apron endwalls, the endwall and the last 2 sections. Ties are not required on installations with masonry endwalls unless the plans show otherwise.

I. Refer to Section 31 23 17 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

3.5 INSTALLATION - DRAINAGE STRUCTURES

A. Install catch basins, inlets, apron end walls, and manholes in accordance with Section 33 05 14.

3.6 CLOSING ABANDONED DRAINAGE SYSTEMS

A. Abandoned Piping: All existing sewer mains shall be properly abandoned at all locations where the new sewer replaces the existing. The abandoned sewer pipe shall be plugged with cellular concrete in accordance with the pertinent requirements of Section 204 of the Wisconsin Department of Transportation Standard Specifications and as directed by the engineer. The abandoned manholes shall have the walls removed at least 2 feet below subgrade within the roadbed and at least 2 feet below grade outside the roadbed. Fill remaining sections of manholes with acceptable fill material. Removed storm sewer shall be disposed of off site.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Clear interior of piping of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and whenever work stops.
   3. Flush piping between manholes and other structures, if required.

C. Compaction Testing: In accordance with ASTM D1557 AASHTO T180 ASTM D2922 ASTM D3017.

D. When tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Compaction Tests: one test per 400 feet of trench per 2 foot lift.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is complete.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

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