

EXHIBIT "B"

COUNTRY GROVE PARK SHELTER

7353 EAST PASS MADISON WI
CITY OF MADISON PARKS DIVISION
CITY OF MADISON CONTRACT #9359 / MUNIS #13937

TECHNICAL SPECIFICATIONS

02.01.2024



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DOCUMENT 00 01 10

TABLE OF CONTENTS

Section No. Title

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 31 46	PERMITS
00 43 25	SUBSTITUTION REQUEST FORM (DURING BIDDING)
00 43 43	WAGE RATES FORM
00 62 76.13	SALES TAX FORM

DIVISION 01 - GENERAL REQUIREMENTS

01 25 13	PRODUCT SUBSTITUTION PROCEDURES
01 26 13	REQUEST FOR INFORMATION (RFI)
01 26 46	CONSTRUCTION BULLETIN (CB)
01 26 57	CHANGE ORDER REQUEST (COR)
01 26 63	CHANGE ORDER (CO)
01 29 73	SCHEDULE OF VALUES
01 29 76	PROGRESS PAYMENT PROCEDURES
01 31 13	PROJECT COORDINATION
01 31 19	PROJECT MEETINGS
01 31 23	PROJECT MANAGEMENT WEB SITE
01 32 16	CONSTRUCTION PROGRESS SCHEDULES
01 32 19	SUBMITTALS SCHEDULE
01 32 23	SURVEY AND LAYOUT DATA
01 32 26	CONSTRUCTION PROGRESS REPORTING
01 32 33	PHOTOGRAPHIC DOCUMENTATION
01 33 23	SUBMITTALS
01 43 39	MOCKUPS
01 45 16	FIELD QUALITY CONTROL PROCEDURES
01 45 29	TESTING LABORATORY SERVICES
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 58 13	TEMPORARY PROJECT SIGNAGE
01 60 00	PRODUCT REQUIREMENTS
01 71 23	FIELD ENGINEERING
01 73 29	CUTTING AND PATCHING
01 74 13	PROGRESS CLEANING
01 74 19	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 76 00	PROTECTING INSTALLED CONSTRUCTION
01 77 00	CLOSEOUT PROCEDURES
01 78 13	COMPLETION AND CORRECTION LIST
01 78 23	OPERATION AND MAINTENANCE DATA
01 78 36	WARRANTIES
01 78 39	AS-BUILT DRAWINGS
01 78 43	SPARE PARTS AND EXTRA MATERIALS
01 79 00	DEMONSTRATION AND TRAINING

DIVISION 02 - EXISTING CONDITIONS

02 41 13	DEMOLITION
----------	------------

DIVISION 03 - CONCRETE

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

DIVISION 04 - MASONRY

04 20 00	UNIT MASONRY
04 43 00	STONE MASONRY

DIVISION 05 - METALS

05 12 00 STRUCTURAL STEEL FRAMING
05 50 00 METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, COMPOSITES

06 10 00 ROUGH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 21 00 THERMAL INSULATION
07 22 16 ROOF BOARD INSULATION
07 46 00 SIDING
07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING
07 62 00 SHEET METAL FLASHING AND TRIM
07 71 00 ROOF SPECIALTIES
07 92 00 JOINT SEALANTS

DIVISION 08 - OPENINGS

08 11 13 HOLLOW METAL DOORS AND FRAMES
08 17 43 COMPOSITE FIBERGLASS DOOR
08 41 13 ALUMINUM FRAMED ENTRANCES AND STOREFRONTS
08 71 00 DOOR HARDWARE
08 80 00 GLAZING

DIVISION 09 - FINISHES

09 29 00 GYPSUM BOARD
09 67 23 RESINOUS FLOORING
09 96 00 HIGH PERFORMANCE COATINGS
09 96 01 MASONRY WEATHER SEAL AND GRAFFITI BLOCK

DIVISION 10 - SPECIALTIES

10 14 00 SIGNAGE
10 21 13 TOILET COMPARTMENTS
10 28 00 TOILET, BATH, AND LAUNDRY ACCESSORIES

DIVISION 22 - PLUMBING

22 05 00 COMMON WORK RESULTS FOR PLUMBING
22 05 14 PLUMBING SPECIALTIES
22 05 15 PIPING SPECIALTIES
22 05 23 GENERAL DUTY VALVES FOR PLUMBING PIPING
22 05 29 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 07 00 PLUMBING INSULATION
22 11 00 FACILITY WATER DISTRIBUTION
22 13 00 FACILITY SANITARY SEWERAGE
22 30 00 PLUMBING EQUIPMENT
22 42 00 COMMERCIAL PLUMBING FIXTURES

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

23 05 00 COMMON WORK RESULTS FOR HVAC
23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT
23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC
23 09 14 PNEUMATIC AND ELECTRIC INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
23 09 93 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
23 31 00 HVAC DUCTS AND CASINGS
23 33 00 AIR DUCT ACCESSORIES
23 34 00 HVAC FANS

23 37 13 DIFFUSERS, REGISTERS AND GRILLES
23 82 00 HEATING AND COOLING TERMINAL UNITS

DIVISION 26 - ELECTRICAL

26 00 00 ELECTRICAL

DIVISION 31 - EARTHWORK

31 10 00 SITE CLEARING
31 20 00 EARTH MOVING

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 12 16 ASPHALT PAVING
32 13 13 CONCRETE PAVING
32 33 00 SITE FURNISHINGS
23 92 00 TURF AND GRASSES

DIVISION 33 - UTILITIES

33 11 00 WATER UTILITY DISTRIBUTION PIPING
33 30 00 SANITARY SEWERAGE UTILITIES

DRAWING INDEX

T000 COVER

CIVIL - SHELTER

C1.0 CIVIL COVER SHEET
C1.1 PROJECT LOCATION
C1.2 EXISTING CONDITIONS
C1.3 DEMOLITION PLAN
C1.4 SITE PLAN
C1.5 GRADING AND EROSION CONTROL PLAN
C1.6 GRADING AND EROSION CONTROL PLAN
C1.7 DESIGN COMPUTATIONS
C1.8 BASIN DETAIL
C1.9 PAVEMENT SECTION DETAILS
C1.10 STORM STRUCTURE DETAIL
C1.11 SITE RESTORATION PLAN
C100 SITE UTILITY PLAN

LANDSCAPE (Reference Only)

L1.0 LANDSCAPE PLAN

CIVIL - COURTS

C2.0 COURT LOCATIONS
C2.1 EXISTING CONDITIONS
C2.2 SITE PLAN
C2.3 GRADING AND EROSION CONTROL PLAN
C2.4 SITE RESTORATION PLAN
C2.5 COURT DETAILS
C2.6 COURTS BASIN DETAIL
C2.7 COURT BASIN STRUCTURE

ARCHITECTURAL

S100 FOUNDATION & FRAMING PLANS & DETAILS
S101 CONCRETE SLAB PLAN
S300 STRUCTURAL DETAILS

A100 FLOOR PLAN & ROOF PLAN, DOOR ELEVATIONS & DETAILS
A101 CLEARSTORY, RCP & ROOF PLANS
A300 EXTERIOR ELEVATIONS
A500 BUILDING SECTIONS
A501 BUILDING SECTIONS & DETAILS

MEP

P000 PLUMBING NOTES AND SCHEDULES
P100 FLOOR PLAN PLUMBING
H100 FLOOR PLAN HVAC
H102 HVAC SCHEDULES AND DETAILS
E000 ELECTRICAL DETAILS, NOTES AND SCHEDULES
E100 FLOOR PLAN ELECTRICAL
SL100 SITE ILLUMINATION PLAN

**SECTION 00 31 46
PERMITS**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. REFERENCES1
7 1.3. GENERAL CONTRACTORS REQUIREMENTS1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED1
9 PART 3 – EXECUTION – THIS SECTION NOT USED1

10
11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

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

22 **1.2. REFERENCES**

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

40 **1.3. GENERAL CONTRACTORS REQUIREMENTS**

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

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

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 PART 2 – PRODUCTS – THIS SECTION NOT USED1
8 PART 3 - EXECUTION1
9 3.1. REQUESTING A SUBSTITUTION DURING BIDDING1
10 3.2. SUBMISSION REVIEW2
11 3.3. SUBSTITUTION APPROVAL2
12 3.4. SUBSTITUTION REQUEST FORM3
13

14 **PART 1 – GENERAL**

15
16 **1.1. SUMMARY**

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

28 **1.2. RELATED SPECIFICATIONS**

- 29 A. 01 25 13 Product Substitution Procedures
30

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

32
33 **PART 3 - EXECUTION**

34
35 **3.1. REQUESTING A SUBSTITUTION DURING BIDDING**

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

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

3.3. SUBSTITUTION APPROVAL

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

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

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3.4. SUBSTITUTION REQUEST FORM

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

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

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**SECTION 00 43 43
WAGE RATES FORM**

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PART 1 – GENERAL1
1.1. SUMMARY1
1.2. RELATED SPECIFICATIONS1
PART 2 – PRODUCTS – NOT USED1
PART 3 - EXECUTION1
3.1. GENERAL REQUIREMENTS.....1
3.2. GENERAL CONTRACTORS RESPONSIBILITIES1

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

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

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

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

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Reimbursable Hourly Rate Worksheet

(see bottom of page for instructions)

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

Enter TRADE Here:

Carpenter

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

Enter YOUR percentage of base rate in the column below.

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

Form Instructions:

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

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END OF SECTION

**SECTION 00 62 76.13
SALES TAX FORM**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATION SECTIONS1
7 1.2. TAX EXEMPT FORM1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED1
9 PART 3 – EXECUTION – THIS SECTION NOT USED1

10
11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

- 14 A. The City of Madison is a qualifying tax exempt entity in the State of Wisconsin.
15 B. The Contractor shall refer to *Section 102.9 – Bidders Understanding of the City of Madison FACILITIES*
16 *MANAGEMENT SPECIFICATIONS for Public Works Construction* for more information on Tax Exempt Status.
17 C. This project constructs or remodels facilities owned by the City of Madison in Madison, Wisconsin.
18

19 **1.2. RELATED SPECIFICATION SECTIONS**

- 20 A. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT
21 SPECIFICATIONS for Public Works Construction”.
22 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
23 <http://www.cityofmadison.com/business/pw/specs.cfm>
24 a. Click on the “Part” chapter identified in the specification text. For example if the specification
25 says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for
26 Part II, the Part II PDF will open.
27 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
28 to the referenced text.
29

30 **1.3. TAX EXEMPT FORM**

- 31 A. The Contractor can access Wisconsin Sales and Use Tax Exemption Certificates (form S-211, Wisconsin
32 Department of Revenue) from the City of Madison Finance website.
33 1. City of Madison tax exempt information and signature by Purchasing Supervisor is already completed.
34 2. Website: <http://www.cityofmadison.com/employeenet/finance/purchasing>
35 a. Under the title *Purchasing Forms*, scroll down to the form link titled *Sales Tax Exempt Form S-211*.
36

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

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

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44 **END OF SECTION**
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SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 PART 2 – PRODUCTS.....1
8 2.1. SUBSTITUTION REQUEST FORM.....1
9 PART 3 - EXECUTION1
10 3.1. REQUESTING A SUBSTITUTION DURING BIDDING1
11 3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT1
12 3.3. UNAUTHORIZED SUBSTITUTIONS.....2
13

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

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

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 47
48
49 A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the
50 substitution request deadline listed in the bidding documents. No substitution request will be considered during
51 the bidding period after the stated substitution request deadline.
52 B. See specification 00 43 25 Substitution Request Form (During Bidding).
53
54

3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT

- 55
56 A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as
57 described in 1.1.B.1 and .2 above.
58 B. The GC shall submit a substitution request using the digital form on the Project Management Web Site.

1 1. Consulting Staff, Owner and Owners Representatives will review the request and provide the appropriate
2 approvals and feed back to the GC.
3

4 **3.3. UNAUTHORIZED SUBSTITUTIONS**

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

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

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END OF SECTION

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. PERFORMANCE REQUIREMENTS.....1
8 1.4. QUALITY ASSURANCE1
9 PART 2 – PRODUCTS.....1
10 2.1. REQUEST FOR INFORMATION FORM1
11 PART 3 - EXECUTION1
12 3.1. CONTRACTOR INITIATED RFI1
13 3.3. RFI RESPONSES2
14 3.4. COMMENCEMENT OF WORK RELATED TO AN RFI.....2
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. Contractors shall use the RFI form/process to request additional information or clarification regarding the
20 construction documents.
21 B. All RFI documentation will be processed through the through the Project Management Web Site (PMWS).
22

1.2. RELATED SPECIFICATIONS

- 23 A. Section 01 26 46 Construction Bulletin (CB)
24 B. Section 01 26 57 Change Order Request (COR)
25 C. Section 01 26 63 Change Order (CO)
26 D. Section 01 31 23 Project Management Web Site (PMWS)
27 E. Section 01 91 00 Commissioning
28
29

1.3. PERFORMANCE REQUIREMENTS

- 30 A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
31 1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.
32 B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one
33 RFI shall be allowed and responded to.
34
35

1.4. QUALITY ASSURANCE

- 36 A. The GC shall be responsible for all of the following:
37 1. Ensure that any request for additional information is valid and the information being requested is not
38 addressed in the construction documents.
39 2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
40 3. Ensure that all Work associated an RFI response is carried out as intended.
41 B. The Project Architect /Project Engineer (A/E PROJ MGR) shall be responsible for the following:
42 1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
43 a. The CPM, Owner, consulting staff, and other City staff shall be responsible for the initial review of
44 the RFI. The A/E PROJ MGR shall be responsible for codifying all consultant and Owner/City staff
45 comments into a unified RFI response.
46
47

PART 2 – PRODUCTS

2.1. REQUEST FOR INFORMATION FORM

- 48 A. The RFI form is located on the Project Management Web Site.
49

PART 3 - EXECUTION

3.1. CONTRACTOR INITIATED RFI

- 50 A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents
51 any contractor may initiate an RFI for additional information or clarification through the GC.
52 B. The GC shall use the Project Management Web Site and completely fill out the form.
53
54
55
56
57
58

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

9 **3.3. RFI RESPONSES**

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

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

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

31
32
33 **END OF SECTION**
34
35

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. PERFORMANCE REQUIREMENTS.....1
8 1.4. QUALITY ASSURANCE2
9 PART 2 – PRODUCTS.....2
10 2.1. CONSTRUCTION BULLETIN FORM2
11 PART 3 - EXECUTION2
12 3.1. WRITING THE CONSTRUCTION BULLETIN2
13 3.2. EXECUTING THE CONSTRUCTION BULLETIN2
14

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. PERFORMANCE REQUIREMENTS

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

1 **1.4. QUALITY ASSURANCE**

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

7 **PART 2 – PRODUCTS**

8
9 **2.1. CONSTRUCTION BULLETIN FORM**

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

12 **PART 3 - EXECUTION**

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

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

27 **3.2. EXECUTING THE CONSTRUCTION BULLETIN**

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

38 **END OF SECTION**
39

**SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATION SECTIONS2
7 1.3. DEFINITIONS AND STANDARDS2
8 1.4. CONTRACT EXTENSION3
9 1.5. OVERHEAD AND PROFIT MARKUP3
10 1.6. PERFORMANCE REQUIREMENTS3
11 1.7. QUALITY ASSURANCE4
12 PART 2 – PRODUCTS4
13 2.1. CHANGE ORDER REQUEST FORM4
14 PART 3 - EXECUTION4
15 3.1. ESTABLISHING A CHANGE ORDER REQUEST4
16 3.2. SUBMIT A CHANGE ORDER REQUEST FORM4
17 3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING4
18 3.4. EMERGENCY CHANGE ORDER REQUEST5

PART 1 – GENERAL

1.1. SUMMARY

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

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

10 **1.2. RELATED SPECIFICATION SECTIONS**

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

26 **1.3. DEFINITIONS AND STANDARDS**

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

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

20 **1.4. CONTRACT EXTENSION**

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

27 **1.5. OVERHEAD AND PROFIT MARKUP**

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

40 **1.6. PERFORMANCE REQUIREMENTS**

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

1
2 **1.7. QUALITY ASSURANCE**

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

12 **PART 2 – PRODUCTS**

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

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

17 **PART 3 - EXECUTION**

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

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

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

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

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

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

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

14 **3.4. EMERGENCY CHANGE ORDER REQUEST**

- 15 A. In the event Work is required due to an emergency as described in the Contract Documents, the GC must
- 16 request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
- 17 commencement of such emergency.
- 18 B. The GC shall provide full documentation of all labor, materials and equipment used during the period of
- 19 emergency as part of the COR submittal.
- 20
- 21
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- 24

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATION SECTIONS1
7 1.3. BOARD OF PUBLIC WORKS PROCEDURE1
8 PART 2 – PRODUCTS.....2
9 2.1. CHANGE ORDER FORM.....2
10 PART 3 - EXECUTION2
11 3.1. PREPARATION OF THE CHANGE ORDER2
12 3.2. EXECUTION OF THE CHANGE ORDER2
13

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. BOARD OF PUBLIC WORKS PROCEDURE

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

1 **PART 2 – PRODUCTS**

2
3 **2.1. CHANGE ORDER FORM**

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

8 **PART 3 - EXECUTION**

9
10 **3.1. PREPARATION OF THE CHANGE ORDER**

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

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

- 23 A. Upon saving the CO as described in section 3.1 above, the software associated with the Project Management
24 Web Site shall notify the GC that the CO has been drafted and is ready for review. The GC shall do the following:
25 1. Open the CO form using the link provided in the email notification and review all items on the form.
26 2. The GC shall notify the CPM immediately of any errors or discrepancies on the form and shall not sign or
27 save it.
28 a. The CPM shall make any corrections as needed, re-save the form, and notify the GC.
29 3. If/when the GC concurs with the CO form as drafted the GC shall digitally sign the form and click SAVE.
30 B. After the GC digitally signs/saves the CO it shall be routed through the Project Management Web Site for
31 additional review and/or approvals. The CPM shall do the following:
32 1. Monitor the review process to ensure the software is working properly at each review step.
33 2. Ensure that proper BPW procedures are executed as needed by the CO approval process.
34 a. Schedule the CO on the next available BPW agenda if required.
35 i. Attend the BPW meeting to speak on the CO to board members and answer questions.
36 ii. The GC and/or the Project Architect /Project Engineer (A/E PROJ MGR) may be required to
37 attend the BPW meeting to address specific information as it relates to the Work and/or
38 materials associated with the CO.
39 3. Monitor final approval and distribution of the CO.
40 4. Notify the GC that the CO has been completed.
41 5. Ensure that the CO is posted to the next Public Works payment schedule.
42 6. Verify that the GC's next Progress Payment-Schedule of Values show the CO as part of the contract sum.
43 C. Upon final approval of the CO the GC may proceed with executing the Work associated with the CO.
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45
46
47
48

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. RELATED DOCUMENTS1
8 1.4. BASIS OF VALUES1
9 PART 2 – PRODUCTS – THIS SECTION NOT USED2
10 PART 3 - EXECUTION2
11 3.1. APPLICATION FOR PAYMENT2
12 3.2. PROJECT MANAGEMENT WEBSITE SOV SPREADSHEET2
13 3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL2
14 3.4. SOV FOR PROGRESS PAYMENT REQUESTS2
15

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

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

1.4. BASIS OF VALUES

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

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

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

5 **PART 3 - EXECUTION**
6

7 **3.1. APPLICATION FOR PAYMENT**

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

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

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

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

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

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

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

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

END OF SECTION

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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. RELATED DOCUMENTS 1
8 1.4. PROGRESS PAYMENT MILESTONES 1
9 1.5. PROGRESS PAYMENT SUBMITTAL 4
10 PART 2 - PRODUCTS - THIS SECTION NOT USED 4
11 PART 3 - EXECUTION 4
12 3.1. GENERAL CONTRACTOR PROCEDURE 4
13 3.3. CITY PROJECT MANAGER PROCEDURE 4
14

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

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

1.4. PROGRESS PAYMENT MILESTONES

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

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

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

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

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

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1.5. PROGRESS PAYMENT SUBMITTAL

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

PART 2 - PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR PROCEDURE

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

3.3. CITY PROJECT MANAGER PROCEDURE

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

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

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**SECTION 01 31 13
PROJECT COORDINATION**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. GENERAL REQUIREMENTS.....1
8 1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS2
9 1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS2
10 PART 2 – PRODUCTS – THIS SECTION NOT USED3
11 PART 3 – EXECUTION – THIS SECTION NOT USED3
12

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. GENERAL REQUIREMENTS

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

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

28 **1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS**

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

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

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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**SECTION 01 31 19
PROJECT MEETINGS**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. PROJECT MEETING TYPES1
8 1.4. GENERAL REQUIREMENTS1
9 PART 2 – PRODUCTS – NOT USED IN THIS SECTION1
10 PART 3 - EXECUTION1
11 3.1. PRECONSTRUCTION MEETING2
12 3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING2
13 3.3. CONSTRUCTION PROGRESS MEETINGS2
14 3.4. PRE-INSTALLATION MEETINGS3
15 3.6 PRE-CONTRACT CLOSEOUT MEETINGS3
16 3.7 OTHER SPECIAL MEETINGS3
17

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. PROJECT MEETING TYPES

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

1.4. GENERAL REQUIREMENTS

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

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

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

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

3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING

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

3.3. CONSTRUCTION PROGRESS MEETINGS

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

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3.4. PRE-INSTALLATION MEETINGS

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

3.6 PRE-CONTRACT CLOSEOUT MEETINGS

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

3.7 OTHER SPECIAL MEETINGS

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

END OF SECTION

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

1
 2
 3 PART 1 – GENERAL1
 4 1.1. GENERAL DESCRIPTION1
 5 1.2. AUTODESK CONSTRUCTION CLOUD PROCEDURE OVERVIEW1
 6 1.3. RELATED SPECIFICATIONS1
 7 PART 2 - PRODUCTS2
 8 2.1. AUTODESK CONSTRUCTION CLOUD SYSTEM RELATED PRODUCTS2
 9 PART 3 - EXECUTION2
 10 3.1. POST BID-OPENING2
 11 3.2. POST PRE-CONSTRUCTION MEETING.....2

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

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

1.2. AUTODESK CONSTRUCTION CLOUD PROCEDURE OVERVIEW

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

1.3. RELATED SPECIFICATIONS

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

**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SCOPE1
6 1.2. RELATED SPECIFICATIONS1
7 PART 2 – PRODUCTS – THIS SECTION NOT USED1
8 PART 3 - EXECUTION1
9 3.1. OVERALL PROJECT SCHEDULE (OPS)1
10 3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)1
11 3.3. PROJECT MANAGEMENT WEB SITE (PMWS).....2
12

PART 1 – GENERAL

1.1. SCOPE

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

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

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

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

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

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

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

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17 **END OF SECTION**
18

**SECTION 01 32 19
SUBMITTALS SCHEDULE**

1
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3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. RELATED DOCUMENTS1
8 1.4. SUBMITTAL DEFINITIONS1
9 1.5. SUBMITTAL REQUIREMENTS2
10 1.6. ADMINISTRATIVE SUBMITTALS2
11 PART 2 – PRODUCTS – THIS SECTION NOT USED2
12 PART 3 - EXECUTION2
13 3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS2
14 3.2. GENERAL CONTRACTORS RESPONSIBILITIES2
15 3.3. STAFF REVIEW RESPONSIBILITIES3
16

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

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

1.4. SUBMITTAL DEFINITIONS

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

1 **1.5. SUBMITTAL REQUIREMENTS**

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

14
15 **1.6. ADMINISTRATIVE SUBMITTALS**

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

24
25 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

26
27 **PART 3 - EXECUTION**

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

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

42 **3.2. GENERAL CONTRACTORS RESPONSIBILITIES**

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

- 1 **3.3. STAFF REVIEW RESPONSIBILITIES**
- 2 A. The Project Architect, consulting staff, Commissioning Agent (CxA), Owner, and city staff will review the
- 3 Submittal Schedule for completeness per the plans and specifications within their divisions of work. The
- 4 reviewing staff may provide comments as needed. Some examples might include the following:
- 5 1. Submittal not required
- 6 2. Provide photos of samples with digital submittal
- 7 3. Insure one submittal for complete system
- 8 4. Append the schedule to include...
- 9 5. See Specification <xyz> for additional requirements
- 10 B. The Project Architect and City Project Manager will finalize review comments regarding the Submittal Schedule.
- 11 Re-submittal of the submittal schedule may be required.
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**SECTION 01 32 23
 SURVEY AND LAYOUT DATA**

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 3
 4 PART 1 – GENERAL 1
 5 1.1. SUMMARY 1
 6 1.2. RELATED SPECIFICATIONS 1
 7 1.3. SURVEYOR QUALIFICATIONS 1
 8 1.4. QUALITY ASSURANCE 1
 9 1.5. SUBMITTALS 2
 10 1.6. EXAMINATION 2
 11 PART 2 – PRODUCTS – NOT USED 2
 12 PART 3 - EXECUTION 2
 13 3.1. PRE-CONSTRUCTION OWNER SUPPORT 2
 14 3.2. UTILITY LOCATING 2
 15 3.3. SURVEY CONTROL AND LAYOUT DATA 2
 16 3.4. TOPOGRAPHIC SURVEYING 2
 17 3.5. SITE SURVEY AS-BUILT 3
 18

PART 1 – GENERAL

1.1. SUMMARY

- A. The purpose of this specification is to set forth the minimal required guidelines 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 (PMWS)
- 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).

- 1 2. All Vertical Control shall be in NAVD88(1991).
2 3. Information on PLSS Section Corner Monuments and Tie Sheets can be found on the City Engineering
3 Mapping website http://gis.cityofmadison.com/Madison_PLSS/PLSS_TieSheets.html.
4

5 **1.5. SUBMITTALS**

- 6 A. After initial project setup the PLS shall provide the following information as a Survey Data Submittal for review
7 by the CPM/CCM, and Owner. See Specification 01 33 23 – Submittals for more information.
8 1. Copy of the PLS (and any supporting staff) current State of Wisconsin registration certificate/licenses.
9 2. Digital Survey Submittal shall be uploaded to the Project Management Web Site. Submittal Survey shall
10 be in Auto CAD format. Digital Submittal shall be of the project site setup showing all of the following:
11 a. Key features not scheduled for demolition, including but not limited to building corners, roof
12 overhangs, and door locations.
13 b. Location of construction limits fencing.
14 c. Locations of PLSS and/or project control points provided by the Owner.
15 d. Locations of project based control points.
16 3. Printed Survey Submittal shall be the same as item 1 above in PDF format. PDF file shall be formatted to
17 print to scale on 24"x36" sheets as required to show all features with text neatly organized for each item
18 identified. When multiple sheets are used a match line and sheet references shall be required.
19 4. PDF file of the complete level/layer scheme. Scheme shall be in tabular form formatted to 8.5 by 11
20 paper and shall include all of the following:
21 a. Level/layer designation (abbreviation).
22 b. Level/layer designation (full title).
23 c. Feature attribute characteristics (line weight, line style, font, etc.).
24 d. Cell attribute information
25 e. Samples of line styles and cells.
26

27 **1.6. EXAMINATION**

- 28 A. The PLS shall be responsible for verifying all site data including the owner provided local control points (see
29 Section 3.1 below) prior to starting the Work.
30 B. Notify the Project Architect and CPM/CCM immediately if any discrepancies are discovered.
31

32 **PART 2 – PRODUCTS – NOT USED**

33
34 **PART 3 - EXECUTION**

35
36 **3.1. PRE-CONSTRUCTION OWNER SUPPORT**

- 37 A. The CPM/CCM shall provide the GC/PLS with a digital CAD seed file on or before the Pre-construction meeting.
38 1. Seed file shall be an Auto Cad seed file using the datum indicated above. Seed file shall be delivered as a
39 Auto Cad format as requested by the PLS.
40 a. Seed file shall be used as the PLS's initial base file for all future work on this contract.
41

42 **3.2. UTILITY LOCATING**

- 43 A. The GC and/or PLS shall be responsible for notifying Diggers Hotline for all utility locate requests.
44

45 **3.3. SURVEY CONTROL AND LAYOUT DATA**

- 46 A. The GC and PLS are responsible for all other survey control and layout data required to perform the work in this
47 contract.
48

49 **3.4. TOPOGRAPHIC SURVEYING**

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

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

END OF SECTION

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**SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATION SECTIONS1
7 1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS1
8 PART 2 – PRODUCTS - THIS SECTION NOT USED1
9 PART 3 - EXECUTION1
10 3.1. CONTRACTOR JOURNAL1
11 3.2. CONSTRUCTION PROGRESS MEETINGS2
12

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

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

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONTRACTOR JOURNAL

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

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

1
2
3
4 PART 1 – GENERAL1
5 1.1. SCOPE1
6 1.2. RELATED SPECIFICATION SECTIONS1
7 1.3. SUBMITTALS1
8 PART 2 – PRODUCTS1
9 2.1. DIGITAL CAMERA1
10 2.1. TIME LAPSE CONSTRUCTION CAMERA (TLCC)1
11 PART 3 – EXECUTION2
12 3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS2
13 3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS2
14

PART 1 – GENERAL

1.1. SCOPE

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. SUBMITTALS

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

PART 2 – PRODUCTS

2.1. DIGITAL CAMERA

- 43 A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital
44 device.
45 B. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is
46 between 600 KB and 3.0 MB (3000KB).
47

2.2. TIME LAPSE CONSTRUCTION CAMERA (TLCC)

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

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

8 **PART 3 – EXECUTION**

9 **3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS**

- 10 A. The GC shall take a minimum of two (2) exterior photographs each week. Exterior photographs will not be
- 11 required on projects that do not include any exterior work.
- 12 1. Exterior photos shall be taken from approximately the same location each week for the duration of the
- 13 project.
- 14 2. When applicable this requirement shall begin prior to commencing any site work.
- 15 3. This requirement shall only be applicable when there is exterior work actively being conducted with the
- 16 project. Periods of inactivity due to weather (winter conditions) do not require a photograph.
- 17 4. This requirement shall end when the exterior work has been substantially completed.
- 18 5. This requirement may be suspended due to weather conditions or substantial delays in exterior progress.
- 19 B. The GC shall take interior photographs each week that document interior construction progress.
- 20 1. This requirement will begin when exterior wall framing begins.
- 21 a. When an interior remodeling project includes demolition work interior photos shall be taken
- 22 during the demolition process.
- 23 2. Pictures do not need to be taken from the same location each week.
- 24 3. This requirement shall end when the interior work has been substantially completed.
- 25 C. Digital photographs shall be properly zoomed in/out, and flash used as needed, to capture a level of detail
- 26 required to properly show the progress being captured by the photograph.
- 27 1. Blurry and dark pictures will not be accepted.
- 28 D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify
- 29 pictures with a title.
- 30 E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the Project Management
- 31 Web Site.
- 32
- 33

34 **3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS**

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

**SECTION 01 33 23
 SUBMITTALS**

1
 2
 3
 4 PART 1 – GENERAL1
 5 1.1. SUMMARY1
 6 1.2. RELATED REFERENCES1
 7 1.3. SUBMITTAL REQUIREMENTS2
 8 PART 2 – PRODUCTS – THIS SECTION NOT USED2
 9 PART 3 - EXECUTION2
 10 3.1. GENERAL CONTRACTOR’S PROCEDURES.....2
 11 3.2. SUBMITTAL REVIEW3
 12 3.3. PROJECT ARCHITECT’S REVIEW3

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED REFERENCES

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

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

6 **1.3. SUBMITTAL REQUIREMENTS**

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

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

46
47 **PART 3 - EXECUTION**

48
49 **3.1. GENERAL CONTRACTOR'S PROCEDURES**

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

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

3 **3.2. SUBMITTAL REVIEW**

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

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

- 14 A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer
15 with the CPM and CxA as needed and determine the appropriate disposition status for the submittal (approved
16 or resubmit).
17 B. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a
18 final disposition of the submittal and update the review status of the submittal to "Complete..." (with or w/o
19 comments) or "Rejected".
20 C. A completed Final Review status will be completed by the City Project or City Construction Manager and initiates
21 the PMWS to notify the GC and appropriate sub-contractor(s) that the review of the submittal has been
22 completed.
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**SECTION 01 43 39
MOCKUPS**

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2
3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. RELATED DOCUMENTS 1
8 1.4. PERFORMANCE REQUIREMENTS 1
9 1.5. QUALITY ASSURANCE 1
10 PART 2 - PRODUCTS 2
11 2.1. MATERIALS 2
12 PART 3 - EXECUTION 2
13 3.1. REVIEW THE PLANS AND SPECIFICATIONS 2
14 3.2. MOCKUP CONSTRUCTION 2
15 3.3. MOCKUP REVIEW 2
16 3.4. FINAL SUBMITTAL 3
17

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.

1
2 **PART 2 - PRODUCTS**

3
4 **2.1. MATERIALS**

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

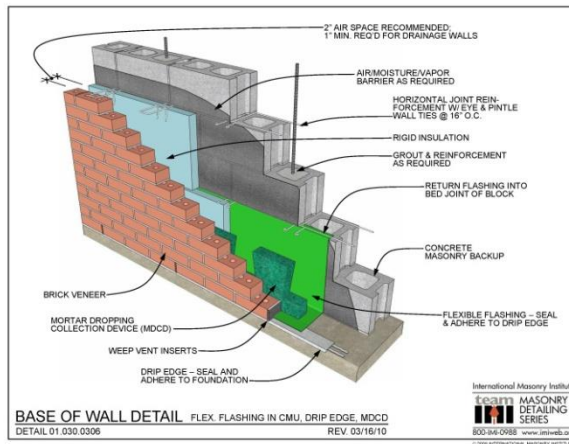
12 **PART 3 - EXECUTION**

13
14 **3.1. REVIEW THE PLANS AND SPECIFICATIONS**

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

24 **3.2. MOCKUP CONSTRUCTION**

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



- 30 D. **LIST REQ'D MOCKUPS HERE**

31
32
33 **3.3. MOCKUP REVIEW**

- 34 A. The General Contractor and all associated Sub-contractors (Contracting Team) shall meet with the Owner,
35 Owners Representative, Architect and Consultants (Design Team) as necessary to review the mock-up.
36 Contractors shall be prepared to answer questions on materials and methods as necessary.
37 B. The Contracting and Design Teams shall review the mockup in detail for materials, methods, and workmanship
38 with respect to the intent of the contract documents. Improvements or adjustments shall be discussed as
39 needed.
40 C. If the mockup is incomplete or does not show sufficient detail of products and workmanship the General
41 Contractor shall resubmit a new mockup.

- 1 D. Re-submittal of mockups to meet the intent of the contract documents shall be the responsibility of the General
2 Contractor. No Change Orders will be processed for additional time or materials associated with re-submitting a
3 mockup for approval.
4 1. In the event that a submitted mockup meets the criteria of the contract documents but does not meet
5 the expectations of the design team and alternative methods or materials are discussed the following
6 procedure shall be used:
7 a. Project Architect shall publish a Construction Bulletin (CB) to detail the required/recommended
8 changes.
9 b. The GC shall prepare and submit a new mockup.

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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 45 16
 FIELD QUALITY CONTROL PROCEDURES**

1
 2
 3
 4 PART 1 – GENERAL 1
 5 1.1. SUMMARY 1
 6 1.2. RELATED SPECIFICATION SECTIONS 1
 7 1.3. PERFORMANCE REQUIREMENTS..... 1
 8 1.4. QUALITY ASSURANCE 2
 9 1.5. QUALITY MANAGEMENT OBSERVATION REPORT 2
 10 PART 2 – PRODUCTS - THIS SECTION NOT USED 2
 11 PART 3 - EXECUTION 2
 12 3.1. QUALITY MANAGEMENT RESPONSIBILITIES 2
 13 3.2. RESPONDING TO A QMO..... 3
 14 3.3. GENERAL CONTRACTORS FOLLOW-UP..... 3
 15 3.4. QMO CLOSEOUT PROCEDURE 3
 16 3.5. CONSTRUCTION CLOSEOUT 3
 17

PART 1 – GENERAL

1.1. SUMMARY

- A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are delivered for the contracted Work.
1. The Project Management Web Site is a Construction Management tool that provides contractors 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 be 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 (PMWS)
- 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.

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

13 **1.4. QUALITY ASSURANCE**

- 14 A. The GC shall be responsible for the following:
- 15 1. All materials, equipment, and products shall be new, clean, undamaged, and meet the performance
- 16 specifications defined within the construction documents including favorably reviewed submittals.
- 17 a. Any material, equipment, or product that does not meet the requirements of the construction
- 18 documents shall be removed and replaced, including any adjacent and related work, at the GCs
- 19 expense.
- 20 2. All Work shall be performed by persons properly trained and/or qualified to produce workmanship of the
- 21 quality specified in the construction documents.
- 22 3. Providing access to updated as-builts, addenda, submittals, bulletins and other related construction
- 23 documents at the project site.
- 24 B. The CoM and its representatives may be responsible for any of the following:
- 25 1. Attend pre-installation meetings
- 26 2. Attend construction progress meetings
- 27 3. Review all submittals
- 28 4. Conduct field visits for QA/QC purposes, provide feedback to the GC and sub-contractors using Quality
- 29 Management Observation (QMO) reports.
- 30 5. Review delivered equipment
- 31 6. Witness equipment installations, startups, testing as specified in other specifications
- 32

33 **1.5. QUALITY MANAGEMENT OBSERVATION REPORT**

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

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

42
43 **PART 3 - EXECUTION**

44
45 **3.1. QUALITY MANAGEMENT RESPONSIBILITIES**

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

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

10 **3.2. RESPONDING TO A QMO**

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

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

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

23 **3.4. QMO CLOSEOUT PROCEDURE**

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

31 **3.5. CONSTRUCTION CLOSEOUT**

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

END OF SECTION

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SECTION 01 45 29
TESTING LABORATORY SERVICES

1
2
3
4 PART 1 – GENERAL1
5 1.1. REQUIREMENTS INCLUDED1
6 1.2. RELATED REQUIREMENTS1
7 1.3. QUALIFICATION OF LABORATORY1
8 1.4. LABORATORY DUTIES1
9 1.5. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY2
10 1.6. CONTRACTOR’S RESPONSIBILITIES2
11 1.7. SPECIFIC TEST, INSPECTIONS, AND METHODS REQUIRED2
12 PART 2 – PRODUCTS – THIS SECTION NOT USED4
13 PART 3 – EXECUTION – THIS SECTION NOT USED4
14

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

- 17
18 A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform specified
19 services and testing.
20 B. Testing Laboratory inspection, sampling and testing is required for:
21 1. Section 03 30 00: Cast-In-Place Concrete
22 2. Section 05 12 00: Structural Steel Framing
23 3. Section 05 40 00: Cold-Formed Steel Framing
24 4. Section 31 20 00: Earthwork
25

1.2. RELATED REQUIREMENTS

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

1.3. QUALIFICATION OF LABORATORY

- 33
34 A. Meet “Recommended Requirements of Independent Laboratory Qualification” published by American Council of
35 Independent Laboratories.
36 B. Meet basic requirements of ASTM E 329, “Standards of Recommended Practice for Inspection and Testing
37 Agencies for Concrete and Steel as Used in Construction.”
38 C. Authorized to operate in State in which the Project is located.
39

1.4. LABORATORY DUTIES

- 40
41 A. Cooperate with Owner, A/E and Contractor; provide qualified personnel after due notice.
42 B. Perform specified inspections, sampling and testing of materials and methods of construction:
43 1. Comply with specified standards.
44 2. Ascertain compliance of materials with requirements of Contract Documents.
45 C. Promptly notify the Owner, A/E and Contractor of observed irregularities or deficiencies of work or products.
46 D. Promptly submit written report of each test and inspection; one copy each to A/E, Consulting Engineer, Owner
47 and Contractor. Each report shall include:
48 1. Date issued.
49 2. Project Title and number.
50 3. Testing laboratory name, address and telephone number.
51 4. Name and signature of laboratory inspector.
52 5. Date and time of sampling or inspection.
53 6. Record of temperature and weather conditions.
54 7. Date of test.
55 8. Identification of product and specification section.
56 9. Location of sample or test in the Project.
57 10. Type of inspection or test.
58 11. Results of tests and compliance with Contract Documents.

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

1 d. Utility Trenches: One test per 50 lineal feet for each two foot or less lift.
2

3

PART 2 – PRODUCTS – THIS SECTION NOT USED

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6

PART 3 – EXECUTION – THIS SECTION NOT USED

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8

9

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

1
 2
 3
 4 PART 1 – GENERAL 1
 5 1.1. SUMMARY 1
 6 1.2. RELATED SPECIFICATION SECTIONS 1
 7 1.3. QUALITY ASSURANCE 1
 8 1.4. TEMPORARY UTILITIES 2
 9 1.5. TELECOMMUNICATIONS SERVICES AND WI-FI..... 2
 10 1.6. TEMPORARY SANITARY FACILITIES..... 2
 11 1.7. BARRIERS..... 2
 12 1.8. FENCING..... 2
 13 1.9. EXTERIOR ENCLOSURES..... 2
 14 1.10. SECURITY 3
 15 1.11. VEHICULAR ACCESS AND PARKING 3
 16 1.12. WASTE REMOVAL..... 3
 17 1.13. PROJECT IDENTIFICATION 3
 18 1.14. FIELD OFFICES..... 3
 19 PART 2 - PRODUCTS 3
 20 2.1. TEMPORARY PARTITIONS..... 3
 21 2.2. EQUIPMENT 3
 22 PART 3 - EXECUTION 4
 23 3.1. TEMPORARY FIRE PROTECTION 4
 24 3.2. COLLECTION AND DISPOSAL OF WASTE..... 4
 25 3.3. ENVIRONMENTAL PROTECTION..... 4
 26 3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS 4

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. QUALITY ASSURANCE

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

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

7 **1.4. TEMPORARY UTILITIES**

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

31 **1.5. TELECOMMUNICATIONS SERVICES AND WI-FI**

- 32 A. Not required.
- 33

34 **1.6. TEMPORARY SANITARY FACILITIES**

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

44 **1.7. BARRIERS**

- 45 A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be
- 46 hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from
- 47 construction operations and demolition.
- 48

49 **1.8. FENCING**

- 50 A. Construction: Refer to Plan Documents and Specification Section 01 76 00: Fencing Materials and Barricades
- 51

52 **1.9. EXTERIOR ENCLOSURES**

- 53 A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions
- 54 and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures
- 55 identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors
- 56 with self-closing hardware and locks.
- 57

1 **1.10. SECURITY**

- 2 A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized
3 entry, vandalism, or theft.
4

5 **1.11. VEHICULAR ACCESS AND PARKING**

- 6 A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for
7 emergency vehicles.
8 B. Coordinate access and haul routes with governing authorities and Owner.
9 C. Provide and maintain access to fire hydrants, free of obstructions.
10 D. Existing parking areas located at 7353 East Pass may be used for construction parking until COUNTRY GROVE
11 PARK SHELTER is occupied by Owner.
12

13 **1.12. WASTE REMOVAL**

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

22 **1.13. PROJECT IDENTIFICATION**

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

27 **1.14. FIELD OFFICES**

- 28 A. Not required.
29 B. If Contractor desires a Field Office, location on site shall be determined at the pre-Construction meeting.
30

31 **PART 2 - PRODUCTS**

32
33 **2.1. TEMPORARY PARTITIONS**

- 34 A. Provide dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and
35 noise.
36 1. Non-fire rated partitions, standard
37 a. Wood stud framing, 6-mil polyethylene
38

39 **2.2. EQUIPMENT**

- 40 A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting
41 materials and employees.
42 B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent
43 insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault
44 circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
45 C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-
46 service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate
47 lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do
48 not exceed safe length-voltage ratio.
49 D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage
50 required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to
51 breakage. Provide exterior fixtures where exposed to moisture.
52 E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by
53 UL, FM or another recognized trade association related to the type of fuel being consumed.
54 F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.
55 G. Fire Extinguishers: General Contractor shall provide hand-carried, portable UL-rated, fire extinguishers of NFPA
56 recommended classes for the exposures, extinguishing agent and size required by location and class of fire
57 exposure.
58

1 **PART 3 - EXECUTION**

2
3 **3.1. TEMPORARY FIRE PROTECTION**

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

19
20 **3.2. COLLECTION AND DISPOSAL OF WASTE**

- 21 A. Collect waste from construction areas and elsewhere daily
22 B. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce
23 requirements strictly.
24 C. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to
25 rise above 80 deg F.
26 D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing
27 properly. Dispose of material in a lawful manner.
28

29 **3.3. ENVIRONMENTAL PROTECTION**

- 30 A. Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply
31 with environmental regulations, and minimize the possibility that air, waterways and subsoil might be
32 contaminated or polluted, or that other undesirable effects might result.
33 B. Avoid use of tools and equipment which produce harmful noise.
34 C. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms
35 near the site.
36

37 **3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS**

- 38 A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.
39 B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
40 C. Clean and repair damage caused by installation or use of temporary work.
41 D. Restore existing facilities used during construction to original condition.
42 E. Restore new permanent facilities used during construction to specified condition.
43
44
45
46

END OF SECTION

**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

1		
2		
3		
4	PART 1 – GENERAL	1
5	1.1. SECTION INCLUDES.....	1
6	1.2. QUALITY ASSURANCE	1
7	1.3. SUBMITTALS.....	1
8	PART 2 - PRODUCTS	1
9	2.1. SIGN MATERIALS	1
10	2.2. PROJECT IDENTIFICATION SIGN.....	1
11	PART 3 - EXECUTION	1
12	3.1. INSTALLATION	1
13	3.2. REMOVAL	1

PART 1 – GENERAL

1.1. SECTION INCLUDES

- A. Project identification sign.

1.2. QUALITY ASSURANCE

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

1.3. SUBMITTALS

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

PART 2 - PRODUCTS

2.1. SIGN MATERIALS

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

2.2. PROJECT IDENTIFICATION SIGN

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

PART 3 - EXECUTION

3.1. INSTALLATION

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

3.2. REMOVAL

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

END OF SECTION

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**SECTION 01 60 00
PRODUCT REQUIREMENTS**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. QUALITY ASSURANCE1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED2
9 PART 3 - EXECUTION2
10 3.1. GENERAL CONTRACTOR REQUIREMENTS2
11 3.2. BULK MATERIAL3
12 3.3. DRY PACKAGED MATERIAL3
13 3.4. STRUCTURAL AND FRAMING MATERIAL3
14 3.5. EQUIPMENT3
15 3.6. FINISH PRODUCTS3
16 3.7. DUCTWORK, PIPING, AND CONDUIT3
17 3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT4
18

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

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

- 1 b. Immediately report any damaged products or equipment to the GC, begin arrangements for
- 2 immediate replacement.
- 3 c. Materials or equipment that have been damaged, are incomplete, or do not comply with the
- 4 construction documents shall not be permitted to be installed.
- 5 2. All materials and products shall be stored within the designated limits of the project site. Only store the
- 6 amount of material necessary for upcoming operations so as not to interfere with other construction
- 7 activities and access to Work by the Owner and Architect. Any offsite storage shall be at the expense of
- 8 the contractor storing the material or product. All offsite storage requirements shall comply with this
- 9 specification. All offsite storage of materials is subject to Owner Representative Quality Management
- 10 review at any time.
- 11 3. Large storage containers may be used but shall be weather tight, securable, placed on concrete blocks,
- 12 timbers, or jack stands and shall be level.
- 13 4. When lifting equipment is required the equipment rating shall be greater than the loading requirements
- 14 of the item being lifted. In addition all of the following shall apply as necessary:
- 15 a. Only designated and/or designed lift points shall be used.
- 16 b. Large items shall have tag lines and handlers at all times during lifting operations.
- 17 c. Lift at multiple points as needed to prevent bending.
- 18 5. Materials and products stored inside of the structure shall comply with all of the following:
- 19 a. Storage shall not be allowed to impede the flow of work in progress.
- 20 b. Storage shall not be allowed to hide completed work from review and inspections.
- 21 c. Storage shall not exceed the design loads of the structural components it is being stored upon.
- 22 6. All materials and products shall be stored according the manufacturers minimum recommended
- 23 requirements. All of the following shall be considered before storing any product or material:
- 24 a. Dust and dirt
- 25 b. Moisture and humidity, including rain and snow
- 26 c. Excessive temperatures, direct sun, etc
- 27 d. Product or material weight and size
- 28 e. Potential for breakage
- 29 f. Product incompatibility with other products such as corrosiveness, chemical reactions,
- 30 flammability, etc.
- 31 g. Product or material value and replacement cost
- 32 7. The Contractor shall be responsible for providing fully functional tarps or plastic wrap, to protect
- 33 materials and products from the weather. All coverings shall be free of large holes and tears, and shall be
- 34 tied, strapped, or weighted down to resist blowing.
- 35 8. The Contractor shall be responsible for any temporary heating, cooling, or other utility requirement that
- 36 may be associated with the storage of a material or product.
- 37 9. The Contractor shall be responsible for securing materials and products of value such as copper, A/V
- 38 equipment, etc. Such items shall be stored in securable shipping containers, job trailers or other such
- 39 storage devices. Container shall be kept secured when not in use.
- 40 B. The GC shall inspect the job site daily to ensure that all products and materials stay weather tight and are
- 41 secured against vandalism or theft as required by this specification.
- 42 C. The Owners Representative may at any time request improvements regarding storage of any material or product
- 43 being provided under these construction documents.
- 44

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR REQUIREMENTS

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

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

**SECTION 01 71 23
FIELD ENGINEERING**

1
2
3
4 PART 1 – GENERAL1
5 1.1. REQUIREMENTS INCLUDED1
6 1.2. RELATED REQUIREMENTS1
7 1.3. PROCEDURES1
8 1.4. PROJECT SURVEY REQUIREMENTS1
9 1.5. RECORDS1
10 PART 2 – PRODUCTS – THIS SECTION NOT USED1
11 PART 3 – EXECUTION – THIS SECTION NOT USED1
12

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

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

1.2. RELATED REQUIREMENTS

- A. Conditions of the Contract

1.3. PROCEDURES

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

1.4. PROJECT SURVEY REQUIREMENTS

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

1.5. RECORDS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

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**SECTION 01 73 29
CUTTING AND PATCHING**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATION SECTIONS1
7 1.3. DEFINITIONS1
8 1.4. QUALITY ASSURANCE1
9 1.5. WARRANTY2
10 PART 2 - MATERIALS2
11 2.1. GENERAL2
12 PART 3 - EXECUTION2
13 3.1. EXAMINATION2
14 3.2. PREPARATION2
15 3.3. PERFORMANCE2
16 3.4. CLEANUP AND RESTORATION3
17

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. DEFINITIONS

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

1.4. QUALITY ASSURANCE

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

1 **1.5. WARRANTY**

- 2 A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting
3 and patching operations, by methods and with materials so as not to void existing warranties.
4

5 **PART 2 - MATERIALS**

6
7 **2.1. GENERAL**

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

14 **PART 3 - EXECUTION**

15
16 **3.1. EXAMINATION**

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

22 **3.2. PREPARATION**

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

33 **3.3. PERFORMANCE**

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

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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.

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**SECTION 01 74 13
PROGRESS CLEANING**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICAITONS1
7 1.3. QUALITY ASSURANCE1
8 PART 2 - PRODUCTS1
9 2.1. CLEANING MATERIALS AND EQUIPMENT1
10 PART 3 - EXECUTION1
11 3.1. SAFETY CLEANING1
12 3.2. PROJECT SITE CLEANING2
13 3.3. PROGRESS CLEANING2
14 3.4. FINAL CLEANING.....3
15 3.5. CALL BACK WORK4
16

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICAITONS

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

1.3. QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

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

PART 3 - EXECUTION

3.1. SAFETY CLEANING

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

- 1 B. Safety Cleaning shall include but not be limited to the following:
- 2 1. All work areas, passageways, ramps, and stairs shall be kept free of debris, scrap materials, pallets, and
- 3 other large items that would obstruct exiting routes. Small items such as tools, electrical cords, etc are
- 4 picked up when not in use.
- 5 2. Form and scrap lumber shall have nails/screws removed or bent over. Lumber shall be neatly stacked in
- 6 an area designated by the GC.
- 7 3. Spills of oil, grease, and other such liquids shall be cleaned immediately or sprinkled with sand/oil-dry
- 8 first, then cleaned.
- 9 4. Oily, flammable, or hazardous items shall be stored in appropriate covered containers and storage
- 10 devices unless actively being used.
- 11 5. Oily, or flammable rags, and other such waste shall only be disposed of in authorized covered containers.
- 12 6. Disposal by burning shall not be allowed at any time.
- 13

14 **3.2. PROJECT SITE CLEANING**

- 15 A. This section applies to the general cleanliness of the project site as a whole for the duration of the execution of
- 16 this contract.
- 17 B. Exterior Project Site Areas
- 18 1. The GC and other Contractors as appropriate shall ensure the following levels of cleanliness are applied
- 19 to the exterior project site areas.
- 20 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
- 21 material waste, job trailers, and the project area are clean and well maintained.
- 22 b. The construction fence is maintained, erect with no gaps, and properly posted per all regulatory
- 23 requirements.
- 24 c. All erosion control measures are properly maintained, cleaned, and repaired as necessary.
- 25 d. All loose materials (construction or waste) are properly tied or weighted down to resist blowing.
- 26 e. All construction materials are properly covered with fully functional tarps or plastic wrap,
- 27 protected from the weather, coverings are tied, strapped, or weighted down to resist blowing.
- 28 f. Dust control is applied as necessary or as required by any regulatory requirement.
- 29 C. Interior Project Site Areas
- 30 1. All Contractors shall ensure the following levels of cleanliness are applied to the interior project site
- 31 areas.
- 32 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
- 33 material waste, and project area are clean and well maintained.
- 34 b. Stored materials are kept in original shipping containers whenever possible. Stored materials not
- 35 in shipping containers are properly stored and protected according to other applicable
- 36 specifications.
- 37 c. All scraps and debris shall be properly disposed of as often as necessary to keep work areas,
- 38 passageways, stairs, and ramps free of debris and clear for emergency exiting.
- 39 d. Boxes, pallets, and other such shipping containers, are broken down, stored in a consolidated area
- 40 or, disposed of as often as is necessary.
- 41 e. Hand tools, supplies, materials, electrical cords not being used are picked up and stored in gang
- 42 boxes, not left as walking hazards in work areas, passageways, etc.
- 43 D. Job Trailer
- 44 1. The interior of the job trailer shall be kept clean and available as a work space at all times. The GC shall
- 45 ensure that the following is provided for within the job trailer:
- 46 a. Meeting space including tables and chairs.
- 47 b. Sufficient space for all contractors to access the official construction documents, provide updates,
- 48 etc.
- 49

50 **3.3. PROGRESS CLEANING**

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

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

3.4. FINAL CLEANING

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

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

3.5. CALL BACK WORK

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

END OF SECTION

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICAITONS1
7 1.3. CITY ORDINANCES1
8 1.4. DEFINITIONS.....2
9 1.5. PERFORMANCE REQUIREMENTS.....2
10 1.6. SUBMITTALS AND DELIVERABLES.....3
11 1.7. QUALITY ASSURANCE3
12 1.8. WASTE MANAGEMENT PLAN4
13 PART 2 – PRODUCTS – THIS SECTION NOT USED4
14 PART 3 - EXECUTION4
15 3.1. PLAN IMPLEMENTATION4
16 3.2. HAZARDOUS AND TOXIC WASTE5
17 3.3. GENERAL GUIDELINES FOR ALL WASTES5
18 3.4. GUIDELINES FOR RECYCLABLE, RE-USABLE, AND SALVAGEABLE WASTE5
19 3.5. GUIDELINES FOR DISPOSAL OF WASTES6
20

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICAITONS

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

1.3. CITY ORDINANCES

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

1.4. DEFINITIONS

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

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

24 1.5. PERFORMANCE REQUIREMENTS

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

44 1.6. SUBMITTALS AND DELIVERABLES

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

- 1 2. Records of Sales: Indicate receipt and acceptance of itemized salvageable waste sold to individuals or
- 2 organizations. Indicate if the organization is tax exempt.
- 3 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by
- 4 recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and
- 5 invoices.
- 6 4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and
- 7 incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- 8 5. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering
- 9 refrigerant shall provide the GC with a statement indicating all of the following:
- 10 a. All recovery was performed according to EPA Regulations.
- 11 b. All refrigerant present was recovered; indicate the total quantity recovered by unit.
- 12 c. Date of Recovery.
- 13 d. Name, address, company name, and phone number of technician performing the recovery.
- 14 e. Technician shall sign and date the statement.
- 15 C. LEED Submittal: The GC shall provide the following information using the appropriate LEED letter template upon
- 16 project completion: indicating that the requirements of the credit have been met. *NOTE: This requirement shall*
- 17 *only apply to projects having a LEED certification goal.*
- 18 1. Total waste material generated.
- 19 2. Total waste material diverted by diversion method; recycling, salvage, re-use, etc.
- 20 3. Which waste streams have been diverted; minimum four different streams required to achieve LEED
- 21 credit
- 22 4. Statement that the credit requirements have been met.
- 23 5. GC shall sign the letter.
- 24

25 **1.7. QUALITY ASSURANCE**

- 26 A. Waste Management Coordinator: The GC shall be responsible for designating a Waste Management
- 27 Coordinator. Coordinator may be the GC Supervisor, GC Project Manager or other member of the GC staff
- 28 having knowledge of proper waste management procedures and all applicable regulations.
- 29 B. Regulatory Requirements: comply with all hauling and disposal regulations of authorities having jurisdiction.
- 30 C. The Waste Management Coordinator shall comply with Specification 01 31 19 Project Meetings, Section 3.7.B.1
- 31 and conduct a Waste Management Conference at the job site. This conference shall be repeated as necessary as
- 32 additional trades are added to the Work. The conference shall include but not be limited to the following:
- 33 1. Identify the Waste Management Coordinator; provide trade contractors with name, phone, and email
- 34 information.
- 35 2. Review and discuss the Waste Management Plan and the roles of the Coordinator.
- 36 3. Review the requirements for documenting and reporting procedures of each type of waste and its
- 37 disposition.
- 38 4. Review procedures for material separation; indicate availability and locations of containers and bins.
- 39 5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
- 40 6. Review waste management procedures specific to each trade.
- 41 D. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- 42

43 **1.8. WASTE MANAGEMENT PLAN**

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

- 1 i. Sizes of containers to be used.
- 2 ii. Labels to be used on the containers to identify the type of waste allowed in the container.
- 3 iii. Designated locations on the project site for waste material containers.
- 4 B. If project requires demolition incorporate the ordinance required (MGO 28.185) Recycling and Reuse Plan into
- 5 the Waste Management Plan.
- 6 C. Provide all of the following for the Waste Management Coordinator:
- 7 1. Name, employer, employer address, phone number, and email address of the designated coordinator.
- 8 a. The GC shall also provide this information with the required Project Directory Submittal at the
- 9 beginning of the project.
- 10 D. If at the option of the GC, they choose to contract with a Waste Management Disposal Company that allows
- 11 comingled and unsorted waste materials, the GC shall include with their Waste Management Plan the following:
- 12 1. Name, address, phone number, state permitting information, and other pertinent information about the
- 13 disposal company.
- 14 2. Documentation from the disposal company indicating company policies and procedures regarding
- 15 comingled and unsorted waste materials to include:
- 16 a. GC responsibilities on the project site.
- 17 b. Disposal company procedures for receiving, sorting, recycling, and disposing of comingled and
- 18 unsorted waste material.
- 19

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

21

22 **PART 3 - EXECUTION**

23

24 **3.1. PLAN IMPLEMENTATION**

- 25 A. Implement the approved waste management plan. Provide adequate containers, storage space, signage,
- 26 transportation and other items required to implement the plan during the execution of this contract.
- 27 B. The GC and Waste Management Coordinator shall be responsible for monitoring and reporting the status of the
- 28 Waste Management Plan and shall monitor the waste management practices on site as frequently as needed.
- 29 C. Train all workers, sub-contractors, and suppliers on proper waste management procedures as appropriate for
- 30 the work being conducted on the project site.
- 31 1. Distribute the waste management plan to everyone concerned within seven (7) days of submittal
- 32 approval.
- 33 2. Distribute the waste management plan to new workers, sub-contractors, and suppliers when they first
- 34 appear on the project site.
- 35 3. Conduct additional training as needed during the execution of the contract to keep a positive focus on
- 36 the waste management plan.
- 37 D. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways,
- 38 and other adjacent and used facilities.
- 39 1. Designate and label specific areas on the project site necessary for separating materials to be salvaged,
- 40 recycled, reused, donated, and sold.
- 41 2. Comply with any specification or regulatory requirements pertaining to dust, dirt, environmental
- 42 protection, and noise control.
- 43

44 **3.2. HAZARDOUS AND TOXIC WASTE**

- 45 A. The Owner shall be responsible under separate contract for the removal of any asbestos related materials. All
- 46 other materials shall be removed by the GC.
- 47 B. All hazardous and toxic waste shall be separated, stored, and disposed of according to all applicable regulations.
- 48 C. All hazardous and toxic materials on site shall have a Material Safety and Data Sheet (MSDS) available that
- 49 indicates storage requirements, emergency information, and disposal requirements as necessary.
- 50

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

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

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. QUALITY ASSURANCE1
7 1.3. RELATED SPECIFICATIONS2
8 PART 2 - PRODUCTS2
9 2.1. FENCING MATERIALS AND BARRICADES2
10 2.2. EROSION CONTROL PROTECTION2
11 2.3. INTERIOR FINISH PROTECTION MATERIALS2
12 PART 3 - EXECUTION3
13 3.1. GENERAL EXECUTION REQUIREMENTS3
14 3.2. PROTECT ADJACENT PROPERTIES3
15 3.3. PROTECT LANDSCAPING FEATURES3
16 3.4. PROTECT UTILITIES4
17 3.5. PROTECT PUBLIC RIGHT OF WAY4
18 3.6. PROTECT STORED MATERIALS.....5
19 3.7. PROTECT WORK - EXTERIOR.....5
20 3.8. PROTECT WORK - INTERIOR5
21

PART 1 – GENERAL

1.1. SUMMARY

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24
25 A. The purpose of this specification is to provide clear responsibilities, guide lines, and requirements related to
26 providing protection to already installed construction.
27 B. Already installed construction shall include but not be limited to the following:
28 1. Any existing site feature such as pavement, curbs, drainage features, utilities, landscaping features (trees,
29 shrubbery, plantings, flagpoles, etc) and other such exterior items not associated with the building
30 whether on or adjacent to the project site.
31 2. Any existing structure on or adjacent to the project site.
32 3. Any existing interior work that may be adjacent to the new work including all paths of ingress/egress to
33 areas associated with accessing the Work.
34 4. Any existing feature of any kind within the public right-of-way that may be on the project site property,
35 adjacent to the project site or across the street from the project site.
36 C. All contractors shall be familiar with the specifications of their Division of Work for specific requirements on
37 protection of the Work.
38 D. The requirements noted within this specification do not relieve any contractor of the responsibility for
39 compliance with any code, statute, ordinance, or other such regulatory requirement having jurisdictional
40 authority over these contract documents.
41

1.2. QUALITY ASSURANCE

- 42
43 A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all
44 existing work, and newly installed construction.
45 B. It shall be the General Contractors’ (GC) responsibility under the contract to provide all reasonable protection
46 methods, materials, or precautionary measures required to protect new or existing construction as described in
47 within this specification to the project as a whole.
48 1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced
49 at no additional cost to the Contract.
50 2. The GC at their discretion may direct other contractors to provide and maintain protection of completed
51 work associated with their Division of Work. I.E.: The carpet installer may be required by the GC to
52 provide carpet protection along traveled paths, ingress/egress, etc after installation.
53 C. It shall be the responsibility of the GC to ensure that all materials being used to protect installed construction are
54 compatible with, and/or adjacent to, the materials being protected. This shall include but not be limited to the
55 material used as covering, tapes used to fasten protective materials, etc.

1
2 **1.3. RELATED SPECIFICATIONS**

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

15
16 **PART 2 - PRODUCTS**

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

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

46
47 **2.2. EROSION CONTROL PROTECTION**

- 48 A. Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2 for authorized materials associated
49 with erosion control materials.

50
51 **2.3. INTERIOR FINISH PROTECTION MATERIALS**

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

- 1 B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect
2 (PA)/Project Engineer (PE) and City Project Manager (CPM) the proposed plan for protection, materials to be
3 used and samples as necessary.
4 1. The PA/PE and CPM reserve the right to disapprove any proposed method and/or material and/or make
5 alternate proposals.
6

7 **PART 3 - EXECUTION**
8

9 **3.1. GENERAL EXECUTION REQUIREMENTS**

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

22 **3.2. PROTECT ADJACENT PROPERTIES**

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

53 **3.3. PROTECT LANDSCAPING FEATURES**

- 54 A. Except where specifically stated in other areas of the construction documents the following minimal protection
55 requirements shall apply under this section.
56 1. Whenever possible do not install new landscape features until exterior building construction has been
57 completed, equipment such as scaffolding and lifts are no longer needed and have been removed, and
58 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.

1 **3.6. PROTECT STORED MATERIALS**

- 2 A. All contractors shall refer to Specification 01 60 00 Product Requirements for all storage and protection
3 requirements of building materials and products delivered to the site.
4

5 **3.7. PROTECT WORK - EXTERIOR**

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

23 **3.8. PROTECT WORK - INTERIOR**

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

- 1 C. All protection shall stay in place until the CPM, PA/PE, and GC mutually deem the project is ready for Final
- 2 Cleaning. The contractors responsible for protecting the work shall be responsible for removing the protection
- 3 and removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning
- 4 materials for removing adhesives, etc.
- 5 D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other
- 6 protection as noted within this specification for the duration of their work.
- 7 1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to
- 8 complete the work being done.
- 9 2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc when doing touch-up
- 10 work.
- 11 3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any
- 12 costs associated with cleaning, repairing or replacing already finished construction at no additional cost
- 13 to the contract.
- 14
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END OF SECTION

**SECTION 01 77 00
 CLOSEOUT PROCEDURES**

1
 2
 3
 4 PART 1 – GENERAL1
 5 1.1. SUMMARY1
 6 1.2. RELATED SPECIFICATIONS1
 7 1.3. DEFINITIONS2
 8 1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT2
 9 1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT2
 10 PART 2 – PRODUCTS – THIS SECTION NOT USED3
 11 PART 3 - EXECUTION3
 12 3.1. CONSTRUCTION CLOSEOUT CHECKLIST3
 13 3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS3
 14 3.3. CONSTRUCTION CLOSEOUT PROCEDURE4
 15 3.4. CONTRACT CLOSEOUT REQUIREMENTS4
 16 3.5. CONTRACT CLOSEOUT PROCEDURE4
 17

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1 **1.3. DEFINITIONS**

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

24
25 **1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT**

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

36
37 **1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT**

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

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

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

8 **PART 3 - EXECUTION**

10 **3.1. CONSTRUCTION CLOSEOUT CHECKLIST**

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

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

40 **3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS**

- 41 A. The timely submittal or completion of closeout requirements shall go hand in hand with the Progress Payment
 42 Milestone Schedule that can be found in Specification 01 29 76 Progress Payments. No payments shall be made
 43 until all requirements for that payment have been met.
- 44 1. The GC and all major Subcontractors, Project Architect /Project EngineerA/E PROJ MGR, and CPM, shall
 45 review all requirements for Construction/Contract Closeout during two (2) special meetings.
 46 a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall
 47 discuss the requirements associated with various construction/contract closeout documentation
 48 and events when they are due with respect to progress payments.
 49

- 1 b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting
2 shall review the contractors progress regarding the closeout checklist, begin making plans for
3 upcoming deadlines such as scheduling training, where to put attic stock, and when they are due
4 with respect to progress payments.
5 2. The GC, A/E PROJ MGR, and CPM, shall utilize the Construction Closeout checklist to ensure that all
6 construction closeout requirements have been met.
7

8 **3.3. CONSTRUCTION CLOSEOUT PROCEDURE**

- 9 A. Upon successful completion and final acceptance of all Construction Closeout Requirements the GC may submit
10 to the CPM and A/E PROJ MGR the request for Final Progress Payment (100% contract total, less retainage).
11 B. The A/E PROJ MGR will confirm with the design consultants, CPM, and other City of Madison staff that all
12 requirements of the Work have been completed and will do the following:
13 1. Approve the final progress payment application
14 2. Provide the required signed payment documents to the CPM
15 3. Provide the required Letter of Substantial Compliance to the following as required:
16 a. State Safety and Building Division
17 b. Local Building Inspection office
18 c. GC
19 d. CPM
20 C. The CPM shall draft the City Letter of Substantial Completion for signature by the City Engineer. This letter shall
21 state any of the following that may still be tied to the contract and/or warranty:
22 1. Indicate that the date of the letter shall also be the beginning of the Warranty period.
23 2. Indicate any allowed due outs, reasons for them, and anticipated dates of finalization.
24 a. QMO issues such as off season testing of equipment
25 b. Off season training of equipment
26 D. The GC and all subcontractors shall finalize all warranty letters associated with their Work using the date noted
27 on the City Letter of Substantial Completion, and provide the CPM with all warranties as described in
28 Specification 01 78 36 Warranties. Upon receipt and final approval of the Warranties the CPM may initiate final
29 processing of the Final Progress Payment (100% contract total, less retainage).
30

31 **3.4. CONTRACT CLOSEOUT REQUIREMENTS**

- 32 A. The GC and all sub-contractors shall follow all requirements associated with documenting contract compliance
33 and provide documentation as required or requested by DCR or PW staff. All contractors are encouraged to stay
34 current with submissions of the following documentation:
35 1. Weekly Payroll Reports no later than the Progress Payment equal to 50% of the contract total.
36 2. Employee Utilization Reports
37 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
38 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
39 5. Documentation required for Small Business Enterprise (SBE) goals
40 6. Other documents as maybe required or requested through the Finalization Review Process
41 B. Near the Progress Payment equal to 80% of the contract total the GC shall request in writing a Finalization
42 Review. At that time DCR or PW staff shall prepare a report of all contract documentation submitted to date. A
43 list of missing items or outstanding issues will be emailed to the GC. No additional follow-up will be generated
44 by DCR or PW Staff.
45

46 **3.5. CONTRACT CLOSEOUT PROCEDURE**

- 47 A. The Contract Closeout Procedure will not begin until the Construction Closeout Procedure has been completed.
48 B. When the GC feels they have successfully met all of the Contract Closeout Requirements associated with Section
49 3.3 above the GC may submit to the request for Final Payment to the CPM.
50 C. The CPM shall sign and submit the Final Payment request for processing.
51 D. DCR and PW staff shall do a complete review of all documentation associated with item 3.3.A above.
52 E. The GC shall be notified directly by DCR or PW Staff of any documentation that may still be missing, have
53 incomplete information, or other outstanding issues. It shall be the responsibility of the GC to continue follow-
54 up with DCR and PW staff until all documentation has been successfully submitted and accepted.
55 F. When all required documentation associated with Contract Closeout has been successfully submitted and
56 accepted by DCR and PW Staff the City of Madison shall process the Final Payment of any remaining monies
57 including retainage.
58

END OF SECTION

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

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30
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38
39
40
41
42
43
44

PART 1 – GENERAL1
1.1. SUMMARY1
1.2. RELATED SPECIFICATIONS1
PART 2 – PRODUCTS – THIS SECTION NOT USED1
PART 3 – EXECUTION – THIS SECTION NOT USED1

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. QUALITY ASSURANCE1
8 1.4. O&M DATA REQUIREMENTS1
9 1.5. O&M DATA SUBMITTALS2
10 PART 2 – PRODUCTS – THIS SECTION NOT USED2
11 PART 3 - EXECUTION2
12 3.1. O&M DATA PREPARATION - GENERAL2
13 3.2. O&M DATA DRAFT SUBMITTAL3
14 3.3. O&M DATA FINAL SUBMITTAL3
15 3.4. CONSTRUCTION CLOSEOUT3
16

17 **PART 1 – GENERAL**

18
19 **1.1. SUMMARY**

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

33 **1.2. RELATED SPECIFICATIONS**

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

44 **1.3. QUALITY ASSURANCE**

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

52 **1.4. O&M DATA REQUIREMENTS**

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

- 1 2. Acceptable PDF files shall have the following functionality:
- 2 a. Word searchable
- 3 b. Key areas are bookmarked
- 4 c. Table of Contents and/or Index linked to content is preferred whenever possible.
- 5 3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be
- 6 rejected without further review.
- 7 B. O&M Data shall include but not be limited to the following manufacturers' published information as appropriate
- 8 for the equipment, system, material, or finish:
- 9 1. Installation instructions
- 10 2. Parts lists, assembly diagrams, explosion diagrams
- 11 3. Wiring diagrams
- 12 4. Start-up, shut-down, troubleshooting and other related operation procedures
- 13 5. Lubrication, testing, parts replacement, and other such maintenance procedures
- 14 6. General use, care, and cleaning instructions
- 15 7. Special precautions and safety requirements
- 16 8. A list of certified equipment vendors, service companies, parts suppliers including company name,
- 17 address, and phone number
- 18 9. A list of the recommended spare parts to have on hand at all times
- 19 10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
- 20 11. Copies of final test reports, balance reports, and other related documentation
- 21 12. Warranty information for equipment and systems
- 22

23 1.5. O&M DATA SUBMITTALS

- 24 A. O&M Data shall be prepared as identified in this specification and shall be submitted for review as per the
- 25 schedule identified in Specification Section 01 29 76, Progress Payment Procedures.
- 26 B. O&M Data Draft submittals will be reviewed for content, procedure, and compliance only. A general critique
- 27 with recommendations for improvement will be made but re-submittals will not be required.
- 28 C. O&M Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be
- 29 required until such time as each submittal is accepted.
- 30

31 *NOTE: Acceptance of O&M Data Final submittals is required to be complete prior to scheduling and conducting owner*

32 *related training and construction closeout.*

33

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

35 **PART 3 - EXECUTION**

36 3.1. O&M DATA PREPARATION - GENERAL

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

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

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

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

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

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

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

45 **3.4. CONSTRUCTION CLOSEOUT**

- 46 A. All contractors shall review Specification 01 77 00, Closeout Procedures and Specification 01 79 00
 47 Demonstration and Training.
 48 1. Acceptance of all final O&M Data submittals is required prior to scheduling Demonstration and Training
 49 Sessions.
 50 2. Completion of all Demonstration and Training Sessions is required to receive the Substantial Compliance
 51 for Occupancy Certificate, and to begin Construction Closeout procedures.
 52
 53
 54

1

END OF SECTION

**SECTION 01 78 36
 WARRANTIES**

1
 2
 3
 4 PART 1 – GENERAL1
 5 1.1. SUMMARY1
 6 1.2. RELATED SPECIFICATIONS1
 7 1.3. DEFINITIONS1
 8 1.4. GENERAL CONTRACTORS RESPONSIBILITIES2
 9 PART 2 – PRODUCTS - THIS SECTION NOT USED3
 10 PART 3 - EXECUTION3
 11 3.1. WARRANTY CHECKLIST3
 12 3.2. LETTERS OF WARRANTY3
 13 3.3. STANDARD PRODUCT WARRANTY4
 14 3.4. FINAL WARRANTY SUBMITTAL4
 15 3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP4
 16

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. DEFINITIONS

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

- 1 1. Expressed Warranty: A warranty that provides specific repair or replacement for covered components of
- 2 a product over a specified length of time.
- 3 2. Implied Warranty: A warranty that is not stated explicitly by a seller or manufacturer that the product is
- 4 merchantable and fit for the intended purpose.
- 5 3. Standard Product Warranty: Preprinted written warranties published by individual manufacturers for
- 6 particular products and are specifically endorsed by the manufacturer to the Owner. Standard warranties
- 7 may be for any amount of time but shall not be for anything less than one (1) year from the warranty
- 8 date.
- 9 4. Special Warranty: A written warranty required by the Contract Documents either to extend the time
- 10 limit provided under a standard warranty or to provide greater rights to the Owner.
- 11 F. Warranty Date: The effective date that begins all warranty periods required for products, installations, and
- 12 work-manship associated with the execution of the Work for this contract. The Warranty Date shall be set by
- 13 the CPM.
- 14 G. Related Damages and Losses: When correcting failed or damaged Warranted Work, remove and reinstall (or
- 15 replace if necessary) the construction that has been damaged as a result of the failure or the construction that
- 16 must be removed and replaced to obtain access for the correction of Warranted Work.
- 17 H. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected reinstate the
- 18 warranty by a new written endorsement. The reinstated warranty shall be equal to the original warranty with an
- 19 equitable adjustment for depreciation unless specifically noted otherwise in a specification.
- 20 I. Replacement Cost: All costs that may be associated with Work being replaced under warranty including but not
- 21 limited to the following:
- 22 1. Related damages and losses
- 23 2. Labor, material and equipment
- 24 3. Permits and inspection fees
- 25 4. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its
- 26 anticipated useful service life.
- 27 J. Replacement Work: All materials, products, required labor, and equipment necessary to replace failed or
- 28 damaged warranted to an acceptable condition that complies with the requirements of the original Construction
- 29 Documents.
- 30 K. Owners Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not
- 31 limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods
- 32 shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations,
- 33 rights, and remedies.
- 34 1. Rejection of Warranties: The Owner reserves the right to reject any warranty and to limit the selection of
- 35 products with warranties not in conflict with the requirements of the contract documents.
- 36 2. Where the Contract Documents require a Special Warranty or similar commitment on the Work or
- 37 product, the Owner reserves the right to refuse acceptance of the Work until the Contractor presents
- 38 evidence the entities required to countersign such required commitments have done so.
- 39

40 1.4. GENERAL CONTRACTORS RESPONSIBILITIES

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

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

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

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

3.2. LETTERS OF WARRANTY

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

- 1 1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the
2 specifications associated with the Work but shall not be less than the industry standard of repair,
3 or replace defective materials and workmanship associated with the installation of the product
4 within one (1) year of the warranty date.
5 5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who
6 agrees to provide warranty services required by any Division Specification in excess of their Standard
7 Product Warranty.
8

9 **3.3. STANDARD PRODUCT WARRANTY**

- 10 A. All contractors shall be responsible for collecting and providing copies of all standard product warranties for
11 commercially available products purchased and installed under this contract.
12 B. Only one copy of the manufacturers' standard warranty needs to be submitted as representative for all
13 quantities of the same model number used throughout the Work.
14 C. Provide the manufacturers certificate, letter, or other standard documentation for each Standard Product
15 Warranty submitted as follows:
16 1. Whenever possible a PDF version of the document shall be used.
17 a. If a PDF version is used all additional information shall be completed using simple PDF editing
18 tools such as text boxes, highlight, etc.
19 b. If a PDF version is not available and an original document is furnished the additional information
20 shall be neatly hand written and highlighted on the document in such a fashion so that it does not
21 obscure any part of the written warranty.
22 2. Provide the following additional information on each warranty document:
23 a. Contract warranty date.
24 b. Provide the manufacturer name and model number of the product if not specified within the
25 warranty.
26 i. Where the manufacturer name and model number is specified within the warranty it shall
27 be highlighted for visibility.
28 c. Provide the plan identifier (LAV-1, WC-2, etc) when applicable.
29 D. Each completed warranty shall be saved as a digital PDF. The file shall be named using the specification number
30 and item description. I.E. 22 42 00 Toilet (WC-1).pdf
31 a. Where an original certificate was furnished provide a high quality colored scan of the completed
32 document with the additional information. Save the scanned image in PDF format and use the
33 same naming convention as indicated above.
34 E. Provide all PDF files and any original documents to the GC for final consolidation to be provided to the Owner.
35

36 **3.4. FINAL WARRANTY SUBMITTAL**

- 37 A. The GC shall receive all required warranties (digital PDF and any original documents) from all contractors,
38 suppliers, installers and manufacturers.
39 B. The GC shall inventory all received warranties with the Warranty Submittal List to ensure all required warranties
40 have been received and all warranty periods are correct according to the specifications.
41 C. Provide with each Operation and Maintenance Manual a complete copy of any associated warranty.
42 D. Scan all warranties into a single organized electronic PDF file as follows:
43 1. Organize the PDF file into an orderly sequence based on the table of contents of the Specifications.
44 2. Provide a typed Table of Contents for the entire file at the front of the document.
45 3. Provide bookmarks and links to each individual PDF to enable quick navigation through the PDF
46 document.
47 E. Upload the warranty submittal to the appropriate document library on the Project Management Web Site for
48 review by the Project Architect (PA)/Project Engineer (PE) and CPM.
49 F. Correct any deficiencies or omissions and resubmit as necessary.
50

51 **3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP**

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

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

1
2

END OF SECTION

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

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICAITONS 1
7 1.3. RELATED DOCUMENTS 1
8 1.4. PERFORMANCE REQUIREMENTS 1
9 1.5. QUALITY ASSURANCE 2
10 PART 2 – PRODUCTS 2
11 2.1. OFFICE SUPPLIES 2
12 PART 3 - EXECUTION 2
13 3.1. FIELD DOCUMENT AS-BUILTS 2
14 3.2. SITE SURVEY AS-BUILT 3
15 3.3. MASTER AS-BUILT DOCUMENT SET 3
16 3.4. AS-BUILT REVIEW AND ACCEPTANCE 4
17 3.5. CHANGES AFTER ACCEPTANCE 5
18

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICAITONS

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

1.3. RELATED DOCUMENTS

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

1.4. PERFORMANCE REQUIREMENTS

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

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

8 **1.5. QUALITY ASSURANCE**

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

24 **PART 2 – PRODUCTS**

25 **2.1. OFFICE SUPPLIES**

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

38 **PART 3 - EXECUTION**

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

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

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

3.4. AS-BUILT REVIEW AND ACCEPTANCE

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

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

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICAITONS1
7 1.3. DEFINITIONS.....1
8 1.4. PERFORMANCE REQUIREMENTS.....1
9 1.5. QUALITY ASSURANCE1
10 PART 2 – PRODUCTS – THIS SECTION NOT USED2
11 PART 3 - EXECUTION2
12 3.1. PACKAGING2
13 3.2. LABELING.....2
14 3.3. INVENTORY.....2
15 3.4. STORAGE3
16 3.5. CLOSEOUT PROCEDURE3
17

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICAITONS

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

1.3. DEFINITIONS

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

1.4. PERFORMANCE REQUIREMENTS

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

1.5. QUALITY ASSURANCE

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. PACKAGING

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

3.2. LABELING

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

3.3. INVENTORY

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

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3.4. STORAGE

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

3.5. CLOSEOUT PROCEDURE

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

END OF SECTION

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**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

1
2
3
4 PART 1 – GENERAL1
5 1.1. SUMMARY1
6 1.2. RELATED SPECIFICATIONS1
7 1.3. QUALITY ASSURANCE1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED2
9 PART 3 - EXECUTION2
10 3.1. GENERAL REQUIREMENTS.....2
11 3.2. COORDINATING AND SCHEDULING THE TRAINING2
12 3.3. TRAINING OBJECTIVES.....2
13 3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION3
14 3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION3
15 3.6. CLOSEOUT PROCEDURE4
16

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

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

3.2. COORDINATING AND SCHEDULING THE TRAINING

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

3.3. TRAINING OBJECTIVES

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

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

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

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

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

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

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

26
27 **3.6. CLOSEOUT PROCEDURE**

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

36 **END OF SECTION**

37

**SECTION 02 41 13
DEMOLITION**

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. These specifications generally follow the guidelines established by the "Standard Specifications for Public Works Construction" by the City of Madison, Wisconsin. The standards can be found at: <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

1.2 SECTION REQUIREMENTS

- A. Coordinate with City items indicated to be removed and salvaged remain Owner's property. Carefully remove from existing construction, in a manner to prevent damage, and deliver to City. Comply with EPA regulations and hauling and disposal regulations of authorities having jurisdiction. Comply with ANSI A10.6 and NFPA 241.
- B. Unless otherwise noted Contractor shall be responsible for obtaining and paying for all permits necessary to complete demolition work.
- C. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces. Submit before Work begins.
- D. It is not expected that hazardous materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all existing utilities, communication systems, alarm systems and other service. Coordinate with local utility company requirements for disconnection of services.
- F. Disconnect all services in manner which ensures continued operation in facilities not scheduled for demolition.

PART 2 - PRODUCTS

1.3 EQUIPMENT

- A. Use Contractor's normal equipment for demolition purposes and which meets all safety requirements imposed on such equipment.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Demolish and remove all buildings, structures and pavements scheduled for demolition as shown on the plans.
- B. Take all measures necessary to safeguard all existing work and facilities which are outside the limits of the work.
- C. Locate, identify, shut off, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
- D. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent site plantings to remain.
- E. Explosives shall not be used for demolition activities.
- F. Carry out vehicle loading as necessary within the project boundaries or as defined or indicated on the drawings, but not in locations that block vehicular traffic on the streets or pedestrian traffic on adjacent public walks.
- G. Dismantle each structure in an orderly manner to provide complete stability of the structure at all times. Provide bracing and shoring where necessary to avoid premature collapse of structure.
- H. Demolish foundation walls and other below grade features in accordance with the plans. Unless otherwise noted, remove all below grade features to a point 4' below adjoining existing grade, or proposed grade, whichever is lower. Basement and/or lowest level floors more than 4' below existing grade need not be removed but must be broken up to permit drainage.
- I. Backfill and compact below grade areas and voids resulting from demolition of structures and other abandonment and demolition.
- J. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, trash and debris.
- K. Promptly remove demolition waste materials from Project site and legally dispose of them. Do not burn demolished materials. Transport and dispose all demolition waste in accordance with local, state, and federal guidelines.

END OF SECTION

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

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, concrete mix designs and submittals required by ACI301.
- B. Ready-Mixed Concrete Producer Qualifications: ASTM C 94/C94M.
- C. Comply with ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain Steel Wire: ASTM A 82, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, as drawn, flat sheet.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- E. Portland Cement: ASTM C 150, Type I or II.
- F. Fly Ash: ASTM C 618, Type C or F.
- G. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- H. Silica Fume: ASTM C 1240, amorphous silica.
- I. Aggregates: ASTM C 33, uniformly graded.
- J. Air-Entraining Admixture: ASTM C 260.
- K. Chemical Admixtures: ASTM C 494, Do not use calcium chloride or admixtures containing calcium chloride.
- L. Vapor Retarder: Reinforced sheet, ASTM E 1745, Class A.
- M. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- N. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- O. Coordinate curing method compatibility with resinous floor finish areas.

2.2 MIXES

- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
 - 1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 - 3. Slump Limit: 5 inches (125 mm) plus or minus 1 inch (25 mm).
 - 4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.
 - 5. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 25 percent.
 - 6. For concrete exposed to deicing chemicals, limit use of fly ash to 25 percent replacement of Portland cement by weight and granulated blast-furnace slag to 40 percent of Portland cement by weight; silica fume to 10 percent of Portland cement by weight.
- C. Measure, batch, mix, and deliver concrete according to ASTM C 94/C94M.
 - 1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.1 CONCRETING

- A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch (3.2 mm) for concrete exposed to view and Class C, 1/2 inch (13 mm) for other concrete surfaces.
- B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.
- C. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- D. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.
- E. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.

- F. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- G. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.
- H. Slab Finishes: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:
 - 1. Scratch finish for surfaces to receive mortar setting beds.
 - 2. Float finish for interior steps and ramps and surfaces to receive waterproofing, roofing, or other direct-applied material.
 - 3. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
 - 4. Trowel and fine-broom finish for surfaces to receive thin-set tile.
 - 5. Nonslip-broom finish to exterior concrete platforms, steps, and ramps.
- I. Cure formed surfaces by moist curing for at least seven days.
- J. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days.
- K. Owner will engage a testing agency to perform field tests and to submit test reports.
- L. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements.
- B. Comply with ACI 530.1/ASCE 6/TMS 602.
- C. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections required by authorities having jurisdiction.
 - 1. Inspections: Level 1 special inspections according to the IBC.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

PART 2 – PRODUCTS

2.1 MASONRY UNITS

- A. Concrete Masonry Units: ASTM C 90; Density Classification, Normal Weight.
 - 1. Integral Water Repellent: Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
 - 2. Special shapes for lintels, corners, jambs, sash, control joints, and other special conditions.
 - 3. Square-edged units for outside corners unless otherwise indicated.
 - 4. Premier Ultra Burnished Masonry Unit - Colored CMU as called out on Drawings – See “FINISH SCHEDULE” – NO SUBSTITUTIONS
 - 5. Available from: County Materials Corporation, 6399 Nesbitt Rd, Madison, WI 53719
 - a) Contact: Megan Paul, Sales Representative
608-556-3333
Megan.paul@countymaterials.com

2.2 MORTAR AND GROUT

- A. Mortar: ASTM C 270, proportion specification.
 - 1. Use Portland cement-lime or masonry cement mortar.
 - 2. Do not use calcium chloride in mortar.
 - 3. For masonry below grade or in contact with earth, use Type S.
 - 4. For reinforced masonry, use Type S.
 - 5. See drawings for colored mortar.
 - 6. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type N.
 - 7. Water-Repellent Additive: For mortar used with concrete masonry units made with integral water repellent, use product recommended by manufacturer of units.
- B. Grout: ASTM C 476 with a slump of 8 to 11 inches (200 to 280mm).
- C. Refractory Mortar: Ground fireclay mortar or other refractory mortar that passes ASTM C 199 test and is acceptable to authorities having jurisdiction.

2.3 REINFORCEMENT, TIES, AND ANCHORS

- A. Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Joint Reinforcement: ASTM A 951.
 - 1. Coating: Hot-dip galvanized at both interior and exterior walls.
 - 2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 - 3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
- C. Corrugated-Metal Veneer Anchors: 7/8 inch (22 mm) wide and made from 0.030-inch- (0.76-mm-) thick steel sheet, galvanized after fabrication.

2.4 EMBEDDED FLASHING MATERIALS

- A. Sheet Metal Flashing: Stainless steel, 0.0156 inch (0.4 mm) thick

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded strips complying with ASTM D 1056, Grade 2A1.
- B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; made from styrene-butadiene rubber or PVC.
- C. Cavity Drainage Material: Free-draining polymer mesh, full depth of cavity with dovetail shaped notches that prevent mortar clogging.

2.6 ANTI-GRAFFITI COATING

- A. Basis of Design: PROSCO, Inc., *Sure-Klean® Weather Seal Blok-Guard® & Graffiti Control II* at all exposed CMU conditions.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cut masonry units with saw. Install with cut surfaces and, where possible, cut edges concealed.
- B. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- C. Stopping and Resuming Work: Rack back units; do not tooth.
- D. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- E. Build non-load-bearing interior partitions full height and install compressible filler in joint between top of partition and underside of structure above.
- F. Tool exposed joints slightly concave when thumbprint hard unless otherwise indicated.
- G. Keep cavities clean of mortar droppings and other materials during construction.

3.2 LINTELS

- A. Install lintels where indicated.
- B. Minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.3 FLASHING AND WEEP HOLES

- A. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing before covering with mortar.
 - 1. Extend flashing 4 inches (100 mm) into masonry at each end and turn up 2 inches (50 mm) to form a pan.
- C. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

3.4 CLEANING

- A. Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly cured, clean exposed masonry.
 - 1. Wet wall surfaces with water before applying acidic cleaner, then remove cleaner promptly by rinsing thoroughly with clear water.
 - 2. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION

SECTION 04 43 00
STONE MASONRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Samples for stone and colored mortar.
- B. Submit qualification data for masonry contractor, including a list of completed projects.
- C. Construct a sample wall panel approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high to demonstrate aesthetic effects and set quality standards for materials and execution.
- D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- E. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Eden Stone Co. Inc, which is located at W4520 Lime Road, Eden, WI 53019.- Telephone 920.477.5221. – **No Substitutions**

2.2 VENEER STONE

- A. Windsor: Eden Seamface.
 - 1. Color: Casual medium golden brown
 - 2. Lengths: Random 8 to 30 inches
 - 3. Heights: 2 to 12 inches
 - 4. Thickness: 2 inches
 - 5. Material shall conform to ASTM C 567 with the following properties:
 - a. Maximum absorption rate of 0.40 percent when tested in accordance with ASTM C 97.
 - b. Minimum density of 170 lbs/cubic ft when tested in accordance with ASTM C 97.
 - c. Minimum compressive strength of 33,000 average psi when tested in accordance with ASTM C 170.

2.3 MORTAR

- A. Mortar for Stone Masonry: ASTM C 270, Proportion Specification, Type S.
 - 1. Color to match Solomon Colors, Inc. – 20x Dark Buff. - Provide Sample
 - 2. Low-Alkali Cement: Use Portland cement with not more than 0.60 percent total alkali per ASTM C 114.
 - 3. Colored Pointing Mortar: Use colored cement product of color selected.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144
 - 1. Color: Provide natural sand of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing.
- D. Water: Potable

2.4 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Stainless steel, 0.016 inch thick elsewhere.

2.5 MISCELLANEOUS MATERIALS

- A. Weep Holes: Round polyethylene tubing, 3/8-inch.
- B. Rainscreen System: Creates pressure-equalized airspace between structural envelope and exterior masonry cladding.
 - 1. Basis of Design: Mortairvent by Advanced Building Products, Inc., 95 Cyro Drive, Sanford, Maine 04073. 800-252-2306 Website www.mortairvent.com.
 - 2. Two-ply mat.
 - 3. Core Mesh: Polypropylene core mesh; spun and heat welded into entangled geomatrix with cornrow configuration.

- 4. Filter Fabric: Polyester; laminated to outside of core mesh.
- 5. Total Thickness: 0.25 inch (6-mm).

2.6 ANTI-GRAFFITI COATING

- A. Basis of Design: PROSCO, Inc., *Sure-Klean® Weather Seal Blok-Guard® & Graffiti Control II* at all exposed CMU conditions.

Coordinate coating compatibility with manufacture’s approved test. Clean stone surfaces and spray a light water mist onto stone. If water is absorbed surface is compatible. If water beads up and runs off then coating is not compatible.

PART 3 – EXECUTION

3.1 SETTING STONE MASONRY, GENERAL

- A. Execute stone masonry by skilled masons experienced with the kind and form of stone and installation method indicated. Follow Building Stone Institute guidelines. Arrange stones for good fit, in pattern indicated.
- B. Maintain uniform joint widths except for variations due to different stone sizes and minor variations required to maintain bond alignment. Lay walls with joints not less than 1/4 inch at narrowest points or more than 1/2 inch at widest points.
- C. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. Extend flashing 4 inches into masonry at each end and turn up 2 inches to form a pan.

3.2 INSTALLING ADHERED STONE MASONRY VENEER

- A. Install 3/8 inch thick scratch coat over CMU. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Tap units into place, completely filling space between units and scratchcoat.
- B. Rake out joints for pointing 3/8 inch deep.

3.3 POINTING

- A. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- B. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce joint profile indicated.

3.4 CLEANING

- A. In-Progress Cleaning: Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly cured, remove large mortar particles, scrub, and rinse stone masonry veneer.
 - 1. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.

END OF SECTION

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings.
- B. Comply with applicable provisions of the following:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 – PRODUCTS

2.1 STRUCTURAL STEEL

- A. W-Shapes: ASTM A 992/A 992M Grade 50 (345).
- B. Channels, Angles ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B structural tubing.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

2.2 ACCESSORIES

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers.
- B. Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
- C. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- D. Grout: ASTM C 1107, nonmetallic, shrinkage resistant, factory packaged.

2.3 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
- C. Shop Priming: Prepare surfaces according to SSPC-SP 2, "Hand Tool Cleaning"; or SSPC-SP 3, "Power Tool Cleaning." Shop prime steel to a dry film thickness of at least 1.5 mils (0.038 mm). Do not prime surfaces to be embedded in concrete or mortar or to be field welded.

PART 3 – EXECUTION

3.1 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing 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 base plate.
 - 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.

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings showing details of fabrication and installation.

PART 2 – PRODUCTS

2.1 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Pipe: ASTM A 53, standard weight (Schedule 40), black finish.

2.2 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.3 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.
- B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth with contour of welded surface matching those adjacent.
- C. Fabricate pipe bollards with hot dipped galvanized coating. Ease exposed top outside edge prior to galvanizing.

2.4 STEEL AND IRON FINISHES

- A. Hot-dip galvanize steel fabrications at exterior locations.
- B. All steel to have high performance paint, see section 09 96 00 HIGH PERFORMANCE COATINGS.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
- C. Anchor bollards in concrete and fill solidly with concrete, mounding top surface.
- D. Galvanized steel bollards are to receive High Performance Coating.

END OF SECTION 05 50 00

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**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for wood-preservative treated wood, engineered wood products and metal framing anchors.

PART 2 – PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.
B. 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.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPA C2, except that lumber not in ground contact and not exposed to the weather may be treated according to AWPA C31 with inorganic boron (SBX).
1. Use treatment containing no arsenic or chromium.
 2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- B. Provide preservative-treated materials for items indicated on Drawings, and the following:
1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Concealed members in contact with masonry or concrete.
 3. Wood framing members that are less than 18 inches (460 mm) above the ground.
 4. Wood floor plates that are installed over concrete slabs-on-grade.
- C. Fire-Retardant-Treated Materials:
1. 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.
 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 (3.2 m) beyond the centerline of the burners at any time during the test.
 - a) Use treatment that does not promote corrosion of metal fasteners.
 - b) Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - c) Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
 3. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 4. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
 5. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 6. Application:
 - a) Treat all rough carpentry unless otherwise indicated.
 - b) Use Exterior type for exterior locations and where indicated.
 - c) Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 - d) Use Interior Type A unless otherwise indicated.

2.3 LUMBER

- A. Dimension Lumber:
1. All lumber to be fire-retardant-treated per section above unless otherwise noted.
 2. Maximum Moisture Content: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for

- 1 more than 2-inch nominal (38-mm actual) thickness.
- 2 3. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 Spruce-pine-fir: NLGA.
- 3 4. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from
- 4 characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay,
- 5 honeycomb, knot-holes, shake, splits, torn grain, and wane.
- 6 a. Species: As specified for framing other than non-load-bearing interior partitions.
- 7 b. Grade: No. 2.
- 8 B. Miscellaneous Lumber: Construction, or No. 2 grade with 15 percent maximum moisture content of any species.
- 9 Provide for nailers, blocking, and similar members.

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11 **2.4 SHEATHING**

- 12 A. Wood Panel Products, General
- 13 1. Oriented Strand Board: DOC PS 2. Exposure Rated.
- 14 2. Fire-Retardant-Treated per section above unless otherwise noted.
- 15 B. Wall Sheathing
- 16 1. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.
- 17 2. Fire-Retardant-Treated per section above unless otherwise noted.
- 18 C. Roof Sheathing
- 19 1. Oriented-Strand-Board Roof Sheathing: Exposure 1, structural sheathing
- 20 2. Fire-Retardant-Treated per section above unless otherwise noted.

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22 **2.5 MISCELLANEOUS PRODUCTS**

- 23 A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of
- 24 high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- 25 1. Power-Driven Fasteners: CABO NER-272.
- 26 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563
- 27 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- 28 B. Metal Framing Anchors: Structural capacity, type, and size indicated.
- 29 1. Use anchors made from hot-dip galvanized steel complying with ASTM A 653/A 653M, G60 (Z180) coating
- 30 designation for interior locations where stainless steel is not indicated.
- 31 2. Use anchors made from stainless steel complying with ASTM A 666, Type 304 for exterior locations and where
- 32 indicated.

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34 **PART 3 – EXECUTION**

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36 **3.1 INSTALLATION**

- 37 A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers,
- 38 blocking, and similar supports to comply with requirements for attaching other construction.
- 39 B. Securely attach rough carpentry to substrates, complying with the following:
- 40 1. CABO NER-272 for power-driven fasteners.
- 41 2. Published requirements of metal framing anchor manufacturer.
- 42 3. Table 2304.9.1, "Fastening Schedule," in the IBC Table R602.3(1).

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END OF SECTION 06 10 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 – PRODUCTS

2.1 INSULATION PRODUCTS

- A. Surface-Burning Characteristics: ASTM E 84, and as follows:
1. Flame-Spread Index: 25 or less where exposed; otherwise, as indicated in Part 2 "Insulation Products" Article.
 2. Smoked-Developed Index: 450 or less.
- B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VI, with flame-spread index of 75 or less. (Below Slab)
- C. Molded-Polystyrene Board Insulation: ASTM C 578, Type I, with flame-spread index of 75 or less. (Ceiling)

2.2 ACCESSORIES

- A. Vapor Retarder: Reinforced polyethylene 6 mils (0.15 mm) thick.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.
- B. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Locate seams at framing members, overlap, and seal with tape.

END OF SECTION 07 21 00

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**SECTION 07 22 16
ROOF BOARD INSULATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide tapered extruded polystyrene roof board insulation.

1.2 SUBMITTALS

- A. Product Data: Submit data on product characteristics, performance criteria, and limitations, including installation instructions.
- B. Sustainable Design: Submit manufacturer's sustainable design certifications as specified.

1.3 QUALITY ASSURANCE

- C. Installer Qualifications: The installation work of this Section shall be performed by an experienced roofing contractor approved and certified by the roofing system manufacturer.
- D. Each insulation board must be labeled with manufacturer's name, product brand name, ASTM material specification reference, and identification of the third party inspection agency used for building code qualification.
- E. Each tapered panel shall be labeled with a code letter to identify its slope and to identify its proper position on the roof. Each panel shall also be marked with an arrow to identify direction of slope.

1.4 DELIVERY, STORAGE, AND HANDLING

- F. Deliver materials in manufacturer's original packaging.
- G. Store and protect products in accordance with manufacturer's instructions. Store in a dry area and protect from water, direct sunlight, flame, and ignition sources. Do not install insulation that has been damaged or wet.
- H. In the event the board insulation becomes wet, wipe dry prior to installation.

1.5 PROJECT CONDITIONS

- I. Roof deck shall be free of ponded water, ice or snow. This precaution is to discourage potential future condensation on the underside of the membrane.
- J. Do not expose tapered insulation to surfaces such as vent stacks, pipes or other rooftop appurtenances whose constant temperature is in excess of 165°F. If temperature cycling conditions are anticipated near the maximum recommended use temperature, consult a representative for recommendations regarding system components.
- K. When insulation is to be exposed to sunlight for prolonged periods due to job site delays, protect the insulation with a light colored opaque covering. Provisions should be made to prevent wind loss of insulation materials at the job site when partially open units of Tapered are on hand.
- L. Dark membrane ballasted systems must have ballast installed immediately after installation of membrane. This precaution is required to prevent potential damage to the insulation from excessive heat due to prolonged exposure to sunlight.
- M. Roofs exposed to chemical discharge, or to reflective vertical surfaces adjacent to the roof, require special consideration. Consult this specification for recommendations regarding system components.
- N. Any deteriorated decking shall be repaired or replaced. Roof drains must be verified to be open and adequate to promote proper roof drainage.

1.6 WARRANTY

- O. A thermal performance warranty shall be issued to the Owner upon completion of the work. Insulation shall be warranted to retain all physical properties and a minimum of 90% of its published R-value for the lifetime of the product.

PART 2 - PRODUCTS

MANUFACTURER

- A. Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com, or equal.

MATERIALS

- B. Extruded Polystyrene (XPS) Insulation:
 - 1. Physical Properties:
 - a) Tapered Materials: Tapered closed-cell foam panels with continuous as-extruded skin on the face and back surfaces, conforming to the minimum physical requirements of ASTM C-578, Type IV.
 - b) Fill Materials: closed-cell foam panels with continuous as-extruded skin on the face and back surfaces, conforming to the minimum physical requirements of ASTM C-578, Type IV.

- 1 2. Product Criteria:
- 2 a) ASTM C578 type IV, certified by independent third party such as RADCO.
- 3 b) Blowing Agent Formulation: Zero ozone depleting.
- 4 c) Compressive Strength (ASTM D 1621): 25 psi, minimum.
- 5 d) Edge Condition: Square edge.
- 6 e) Thermal Resistance (180 day real-time aging as mandated by ASTM C 578, measured per ASTM C 518
- 7 at mean temperature of 75F): R-5.0 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.
- 8
- 9 f) Water Absorption (ASTM C272): Maximum [0.10] percent by volume.
- 10 g) Surface Burning Characteristics (ASTM E 84): Flame spread less than 25, smoke developed less than
- 11 450, certified by independent third party such as Underwriters Laboratories (UL).
- 12 h) Indoor Air Quality: Compliance certified by independent third party such as GreenGuard Indoor Air
- 13 Quality Certified® and/or GreenGuard Children and Schools Certified™.
- 14 i) Recycle Content: Minimum 20%, certified by independent third party such as Scientific Certification
- 15 Systems.
- 16 j) Warranty: Limited lifetime warranty covering all ASTM C578 physical properties.
- 17 3. Manufacturers: Subject to compliance with product criteria, the manufacturers whose products may be incorporated into the work include but are not limited to:
- 18
- 19 a) DiversiFoam Products.
- 20 b) Dow Chemical Company.
- 21 c) Owens Corning.
- 22 d) Pactiv Corporation.
- 23 C. Overlayment: For dark mechanically attached, or any color fully adhered, or chemically incompatible membranes, provide the following:
- 24
- 25 1. Glass mat faced gypsum roof board.
- 26 2. Flexible glass fiber, nonwoven, non-flammable, corrosion and mildew resistant or other suitable separator (overlayment) sheets shall be used under PVC membranes and other such membranes which contain plasticizing agents. Separator sheet shall have been evaluated and approved by the membrane manufacturer for adequacy as a separator.
- 27
- 28
- 29
- 30 D. Adhesion System: Per membrane manufacturer's specifications.
- 31

32 **PART 3 - EXECUTION**

33

34 **3.1 EXAMINATION**

- 35 A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation.
- 36
- 37 1. Verify that the roof deck drains completely free of water within 48 hours following rainfall.
- 38 2. Verify that the dead load carrying capability of the deck is sufficient to support code mandated live loads and dead loads incident on the roof, including the entire roof covering/insulation system.
- 39
- 40 3. Verify that the roof deck provides adequate support for the insulation.
- 41 B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- 42

1 **3.2 ROOF DECK PREPARATION**

- 2 C. Any deteriorated roof decking shall be repaired or replaced.
3 D. A thorough inspection should be required in the case of total tear off.
4 E. The surface must be clean, smooth, free of fins, sharp edges, loose and foreign materials, oil, grease, and fresh roofing
5 cement. Repair any deck joints or cracks, any deck to wall junctions, and any other deck to penetration gaps, which
6 are greater than 1/4".
7 F. Install deck and secure in accordance with construction drawings. The deck must be well secured with all mechanical
8 fasteners flush with the surface of the deck. The deck must be of sufficient thickness to develop adequate fastener
9 holding power. Verify requirements with the membrane manufacturer.

10
11 **3.3 VAPOR RETARDER**

- 12 G. Install a vapor retarder in accordance with construction drawings. Place the vapor retarder to insure adequate end and
13 side joint laps. When high relative humidities inside the building or other normal climatic conditions create a conden-
14 sation point within the insulation board, it may be necessary to install a vapor retarder beneath the insulation or ther-
15 mal barrier. Although tapered/fill layers of insulation have vapor retarding qualities, the need for more effective vapor
16 retarding layers must be assessed based on the conditions present on each project. Tapered and fill layers of insulation
17 are compatible with most commonly used asphaltic and sheet film vapor retarding materials. See the American Society
18 of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals for specific design guide-
19 lines.
20

21 **3.4 INSULATION**

- 22 H. Install tapered roof insulation in accordance with the manufacturer's approved shop drawings.
23 I. Install thicknesses of fill in accordance with shop drawings prepared by manufacture and approved by the roofing con-
24 tractor. Install tapered over the required base layers, following the directional arrow printed on each panel which
25 indicates direction of slope. Note that Tapered panels also have a letter code printed on their surface which corre-
26 sponds with panel layout shown on the approved shop drawings.
27 J. Insulation joints shall not exceed 1/4" in width. Joints wider than 1/4" shall be filled with the same insulation.
28 K. Insulation shall be field trimmed to fit tightly around roof protrusions and terminations.
29 L. Apply only as much tapered and fill roof insulation as can be covered by the roofing membrane on the same day. Apply
30 roof insulation in parallel rows with end joints staggered. Install side and end joints closely but do not force together.
31 In a two layer application, apply second layer panels parallel to the first layer but with side and end joints staggered in
32 relation to the first layer.
33 M. In areas where black/dark membranes are used and where "reflected solar energy" is expected to be present, insulation
34 need protection in addition to normally specified cover boards. For example, roof areas adjacent to higher walls, parti-
35 cularly walls with reflective surfaces, or near large rooftop HVAC units, or near or in between clusters of mechanical
36 equipment, or near other structures with reflective cladding (metal or glass); or near higher reflective parapets, all such
37 areas should be considered for additional heat protection. Such roof areas must be covered with pavers or ballast.
38 Black/dark (non-white) membranes must be coated with white reflective topping, and maintained white, to avoid dam-
39 age due to the intensified heat exposure from reflected sun in such areas.
40 N. Insulation shall be loosely placed, secured in accordance with membrane manufacturer's requirements. The insulation
41 below the membrane is to be held in place with compatible adhesives in conjunction with the overlayment and/or
42 membrane system. When adhering or exposing Tapered/fill insulation to hot bitumen, the bitumen must be allowed
43 to cool to between 200°F and 250°F.
44

45 **3.5 OVERLAYMENT**

- 46 O. Only dry overlayment materials shall be used. If overlayment materials become wet, allow them to fully dry before
47 proceeding with roofing application. Requirements for overlayment materials and thickness may vary. Contact mem-
48 brane manufacturer for their individual requirements.
49 P. Rigid overlayment shall be adhered with a suitable adhesive per manufacturer's recommendations. Loose lay flexible
50 sheet overlayment over Tapered and cover with a membrane attached per the manufacturer's recommendations.
51 Edges and ends of rolls shall be lapped a minimum of 6".
52 Q. When cleaning agents and seam adhesives used are solvent based and capable of causing cavitation of the underlying
53 insulation, use care when preparing membrane edges for in-field seam splicing.
54 R. In areas where black/dark membranes are used and where "reflected solar energy" is expected to be present, need
55 protection in addition to normally specified cover boards. For example, roof areas adjacent to higher walls, particularly
56 walls with reflective surfaces, or near large rooftop HVAC units, or near or in between clusters of mechanical equip-
57 ment, or near other structures with reflective cladding (metal or glass); or near higher reflective parapets, all such areas
58 should be considered for additional heat protection. Such roof areas must be covered with pavers or ballast. Black/dark
59 (non-white) membranes must be coated with white reflective topping, and maintained white, to avoid damage due to
60 the intensified heat exposure from reflected sun in such areas.

1
2

END OF SECTION 03 30 00

**SECTION 07 46 00
SIDING**

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ5 Engineered for Climate Siding.
- B. Factory-finished fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ5 Engineered for Climate Siding.
- C. Pre-Finished fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ5 Engineered for Climate Siding.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Wood Framing and Bracing.
- B. Section 06100 - Rough Carpentry: Sheathing.
- C. Section 07210 - Insulation: Exterior wall insulation.

1.3 REFERENCES

- A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets
- B. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
 - 1. HardiePlank HZ5 lap siding for 30 years.

- 1 2. HardiPanel HZ5 vertical siding for 30 years.
2 B. Product Warranty: Limited, product warranty.
3 1. HardieTrim HZ and HZ5 boards for 15 years.
4 C. Finish Warranty (James Hardie): Limited product warranty against manufacturing finish defects.
5 1. When used for its intended purpose, properly installed and maintained according to James Hardie's published
6 installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years
7 from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage
8 for labor and material.
9 D. Pre-Finisher Finish Warranty (Edmund A. Allen Lumber Company): 1 Coat – 20 Year Limited Factory Finish Warranty –
10 Commercial Application.
11 E. Workmanship Warranty: Application limited warranty for 2 years.
12

13 **PART 2 – PRODUCTS**

14 **2.1 MANUFACTURERS**

- 15 A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400;
16 Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Fax: 949-367-4981; Email: [request info](mailto:requestinfo@jameshardie.com)
17 (info@jameshardie.com); Web: www.jameshardiecommercial.com
18 1. Local Representative:
19 Paul Coates
20 James Hardie - Regional Representative
21 (414) 552-0507
22 paul.coates@jameshardie.com
23 B. Substitutions: **Not Permitted.**
24

25 **2.2 SIDING**

- 26 A. Vertical Siding: HardiePanel HZ5 siding as manufactured by James Hardie Building Products, Inc.
27 1. Type: Smooth Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
28 B. Lap Siding: HardiePlank HZ5 Lap siding with a sloped top, beveled drip edge and nailing line as manufactured by
29 James Hardie Building Products, Inc.
30 1. Type: Smooth 7-1/4 inches (184 mm) with 6 inches (152 mm) exposure.
31 C. Trim:
32 1. HardieTrim HZ5 boards and HardieTrim HZ boards as manufactured by James Hardie Building Products, Inc.
33 2. HardieTrim HZ5 Fascia boards as manufactured by James Hardie Building Products, Inc.
34

35 **2.3 FASTENERS**

- 36 A. Wood Framing Fasteners:
37 1. Wood Framing: 4d common corrosion resistant nails.
38 2. Wood Framing: 6d common corrosion resistant nails.
39 3. Wood Framing: 8d box ring common corrosion resistant nails.
40 4. Wood Framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant
41 siding nails.
42 5. Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant
43 siding nails.
44 6. Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2-1/2 inches (64 mm) corrosion
45 resistant siding nails.
46 7. Wood Framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion
47 resistant siding nails.
48 8. Wood Framing: 0.091 inch (2.3 mm) shank by 0.225 inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion
49 resistant siding nails.
50 9. Wood Framing: 0.121 inch (3 mm) shank by 0.371 inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion
51 resistant roofing nails.
52 10. Wood Framing: No. 11 gauge 1-1/4 inches (32 mm) corrosion resistant roofing nails.
53 11. Wood Framing: No. 11 gauge 1-1/2 inches (38 mm) corrosion resistant roofing nails.
54

- 1 12. Wood Framing: No. 11 gauge 1-3/4 inches (44 mm) corrosion resistant roofing nails.
- 2 B. Metal Framing:
- 3 1. Metal Framing: 1-1/4 inches (32 mm) No. 8-18 by 0.375 inch (9.5 mm) head self-drilling, corrosion resistant S-
- 4 12 ribbed buglehead screws.
- 5 2. Metal Framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-
- 6 12 ribbed buglehead screws.
- 7 3. Metal Framing: 1 inch (25 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant ribbed
- 8 buglehead screws.
- 9 4. Metal Framing: 1 inch (25 mm) No. 8-18 by 0.311 inch (7.9 mm) head self-drilling, corrosion resistant S-12
- 10 ribbed buglehead screws.
- 11 5. Metal Framing: 1.5 inch (38mm) [AGS-100] .100 inches by 25 inches (2540 mm by 635 mm) ET&F Pin or
- 12 equivalent pneumatic fastener.
- 13
- 14 C. Masonry Walls (CMU)
- 15 1. Masonry Walls: Aerico Stud Nail, ET&F ASM No.-144-125, 0.14 inch (3.6 mm) shank by 0.30 inch (7.6 mm) head
- 16 by 2 inches (51 mm) long corrosion resistant nails.
- 17
- 18 **2.4 FINISHES**
- 19 A. Factory Primer: Provide factory applied universal primer.
- 20 1. Primer: Factory primed by James Hardie.
- 21 2. Topcoat: Refer to Section 09900 and Finish Schedule.
- 22 B. Factory Finish (James Hardie): See drawings for "Finish Schedule".
- 23 1. Product: ColorPlus Technology by James Hardie.
- 24 2. Definition: Factory applied finish; defined as a finish applied in the same facility and company that
- 25 manufactures the siding substrate.
- 26 3. Process:
- 27 a. Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber
- 28 cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing
- 29 process.
- 30 b. Each finish color must have documented color match to delta E of 0.5 or better between product lines,
- 31 manufacturing lots or production runs as measured by photospectrometer and verified by third party.
- 32 4. Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
- 33 5. Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement
- 34 manufacturer. Provide quantities as recommended by manufacturer.
- 35 C. Pre-Finisher Finish (Non James Hardie)
- 36 1. Definition: Off site applied finish, defined as a finish applied in a separate facility and by a separate company
- 37 that manufactures the siding substrate.
- 38 2. Process:
- 39 a. Factory applied finish by qualified James Hardie pre-finisher in a controlled environment in their own
- 40 facility utilizing an approved coating and curing methods within one manufacturing process.
- 41 b. Each finish color must have documented color match to delta E of 0.5 or better between product lines,
- 42 manufacturing lots or production runs as measured by photospectrometer and verified by third party.
- 43 3. Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
- 44 4. Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement
- 45 manufacturer. Provide quantities as recommended by manufacturer.
- 46 5. Approved Qualified Pre-Finisher
- 47 a. Edmund A. Allen Lumber Company, 117 Industrial Drive, Momence, IL 60954, 800-892-1884
- 48 Contact: Rodney Felder - WI Territory Manager
- 49 Cell: 262-325-1974
- 50 rfelder@edmundallen.com
- 51 D. Factory Finish and Pre-Finisher Colors for Trim, Soffit and Siding Colors:
- 52 1. See Drawings for "Finish Schedule".
- 53

1 **PART 3 – EXECUTION**

2
3 **3.1 EXAMINATION**

- 4 A. Do not begin installation until substrates have been properly prepared.
- 5 B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before
- 6 proceeding.
- 7 C. Nominal 2 inch by 4 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local
- 8 building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches
- 9 (38 mm) face and straight, true, of uniform dimensions and properly aligned.
- 10 1. Install water-resistive barriers and claddings to dry surfaces.
- 11 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
- 12 3. Protect siding from other trades.
- 13 D. Minimum 20 gauge 3-5/8 inch (92 mm) C-Stud 16 inches maximum on center or 16 gauge 3-5/8 inches (92 mm) C-
- 14 Stud 24 inches (610 mm) maximum on center metal framing complying with local building codes, including the use of
- 15 water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true,
- 16 of uniform dimensions and properly aligned.
- 17 1. Install water-resistive barriers and claddings to dry surfaces.
- 18 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
- 19 3. Protect siding from other trades.

20
21 **3.2 PREPARATION**

- 22 A. Clean surfaces thoroughly prior to installation.
- 23 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the
- 24 substrate under the project conditions.
- 25 C. Install a water-resistive barrier is required in accordance with local building code requirements.
- 26 D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with
- 27 local building code requirements.
- 28 E. Install Engineered weather barrier in accordance with local building code requirements.
- 29 F. Use HardieWrap™ Seam Tape and joint and laps.
- 30 G. Install HardieWrap™ flashing, and HardieWrap™ Flex Flashing

31
32 **3.3 INSTALLATION - HARDIEPANEL HZ5 VERTICAL SIDING**

- 33 A. Install materials in strict accordance with manufacturer's installation instructions.
- 34 B. Block framing between studs where HardiePanel siding horizontal joints occur.
- 35 C. Install metal Z flashing and provide a 1/4 inch (6 mm) gap at horizontal panel joints.
- 36 D. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- 37 E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the
- 38 manufacturer's installation instructions.
- 39 F. Maintain clearance between siding and adjacent finished grade.
- 40 G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
- 41 H. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
- 42 1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
- 43 2. Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent
- 44 spotting of touch-up finish.
- 45 3. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished
- 46 siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

47
48 **3.4 INSTALLATION - HARDIEPLANK HZ5 LAP SIDING**

- 49 A. Install materials in strict accordance with manufacturer's installation instructions.
- 50 B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks
- 51 horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the
- 52 starter strip.
- 53 C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the
- 54 manufacturer's installation instructions.
- 55 D. Align vertical joints of the planks over framing members.
- 56 E. Maintain clearance between siding and adjacent finished grade.
- 57 F. Locate splices at least one stud cavity away from window and door openings.

- 1 G. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing
2 members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
3 H. Locate splices at least 12 inches (305 mm) away from window and door openings.
4

5 **3.5 FINISHING**

- 6 A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100
7 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent
8 acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product
9 recommendation and written application instructions.
10 B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based
11 exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation
12 and written application instructions.
13 C. Pre-Finished one coat siding requires field finishing. Finish pre-finished siding with a minimum of one coat of high
14 quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow qualified
15 pre-finisher's re-coat instructions and paint manufacturer's written product recommendation and written application
16 instructions.
17

18 **3.6 PROTECTION**

- 19 A. Protect installed products until completion of project.
20 B. Touch-up, repair or replace damaged products before Substantial Completion.
21
22

END OF SECTION 07 46 00

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SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Adhered EPDM membrane roofing system.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- B. Source Limitations: Obtain components including for membrane roofing system from same manufacturer.
- C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- D. Preinstallation Roofing Conference: Conduct conference at Project site. Manufacturer's representative shall be present.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 EPDM MEMBRANE ROOFING

- A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a) Carlisle SynTec Incorporated.
 - b) Firestone Building Products.
 - c) GAF Materials Corporation.
 - 2. Thickness: 60 mils (1.5 mm) nominal.
 - 3. Exposed Face Color: Black.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a) Plastic Foam Adhesives: 50 g/L.
 - b) Gypsum Board and Panel Adhesives: 50 g/L.

- 1 c) Multipurpose Construction Adhesives: 70 g/L.
- 2 d) Fiberglass Adhesives: 80 g/L.
- 3 e) Single-Ply Roof Membrane Adhesives: 250 g/L.
- 4 f) Single-Ply Roof Membrane Sealants: 450 g/L.
- 5 g) Nonmembrane Roof Sealants: 300 g/L.
- 6 h) Sealant Primers for Nonporous Substrates: 250 g/L.
- 7 i) Sealant Primers for Porous Substrates: 775 g/L.
- 8 j) Other Adhesives and Sealants: 250 g/L.
- 9 B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
- 10 C. Bonding Adhesive: Manufacturer's standard, water based.
- 11 D. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3- inch-wide minimum, butyl
- 12 splice tape with release film.
- 13 E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions
- 14 in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system
- 15 manufacturer.
- 16 F. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens,
- 17 pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings,
- 18 reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other
- 19 accessories.
- 20

21 **2.3 SUBSTRATE BOARDS**

- 22 A. Substrate Board: ½ inch manufacturer's standard material as required for roof warranty.
- 23 B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions
- 24 in FM Approvals 4470, designed for fastening substrate panel to roof deck.
- 25

26 **PART 3 – EXECUTION**

27 **3.1 SUBSTRATE BOARD**

- 28 A. Install manufacturers approved substrate board with long joints in continuous straight lines, perpendicular to roof
- 29 slopes with end joints staggered between rows. Tightly butt substrate boards together.
- 30
- 31 1. Fasten substrate board to top flanges of wood deck to resist uplift pressure at corners, perimeter, and field of
- 32 roof according to membrane roofing system manufacturers' written instructions.
- 33

34 **3.2 ADHERED MEMBRANE ROOFING INSTALLATION**

- 35 A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's
- 36 written instructions. Unroll membrane roofing and allow to relax before installing.
- 37 B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by
- 38 manufacturer. Stagger end laps.
- 39 C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and
- 40 allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- 41 D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and
- 42 perimeters.
- 43 E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps
- 44 of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam
- 45 installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.
- 46 F. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
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48 **3.3 BASE FLASHING INSTALLATION**

- 49 A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing
- 50 system manufacturer's written instructions.
- 51 B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do
- 52 not apply to seam area of flashing.
- 53 C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- 54 D. Clean splice areas apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a
- 55 watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- 56 E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

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3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM PART 1 – GENERAL

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1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data Shop Drawings, and Samples.
- B. Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- C. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

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PART 2 - PRODUCTS

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1. SHEET METAL

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, not less than 22 ga. thick; and finished as follows:
 - 1. Finish: Manufacturer's standard two-coat fluoropolymer system with color coat containing not less than 70 percent PVDF resin by weight
 - 2. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish.

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2.2 ACCESSORIES

- A. Self-Adhering Sheet Underlayment, High Temperature: Butyl or SBS-modified asphalt; slip-resisting-polyethylene surfaced; with release paper backing; cold applied. Stable after testing at 240 deg F (116 deg C) and passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosinsized.
- C. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners.
 - 1. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- D. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

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2.3 FABRICATION

- A. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with SMACNA's "Architectural Sheet Metal Manual." Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanently watertight and weatherproof; conceal fasteners where possible.
- B. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- C. Fabricate nonmoving seams in sheet metal with flat-lock seams. For aluminum, form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- D. Aluminum Flashing and Trim: Coat back side of aluminum flashing and trim with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.
- E. Separate dissimilar metals with a bituminous coating or polymer-modified, bituminous sheet underlayment.

END OF SECTION 07 62 00

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SECTION 07 71 00
ROOF SPECIALTIES

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and color Samples.
- B. Warranties: Provide manufacturer's standard written warranty, signed by manufacturer agreeing to promptly repair or replace roof specialties that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper as recommended by manufacturer for use and finish indicated.
- C. Aluminum Finish: Two-coat fluoropolymer system with color coat containing not less than 70 percent PVDF resin by weight.
- D. Self-Adhering Sheet Underlayment, High Temperature: Butyl or SBS-modified asphalt; slip-resisting-polyethylene surfaced; with release paper backing; cold applied. Stable after testing at 240 deg F (116 deg C) and passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
- E. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements.
 - 1. Exposed Penetrating Fasteners: Gasketed screws with heads matching color of metal.
 - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- F. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.
- G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 ROOF SPECIALTIES

- A. Copings: Manufactured coping system consisting of formed-metal coping cap, concealed anchorage; corner units, end cap units, and concealed splice plates. Provide spring tension and hold down cleats both sides.
 - 1. Formed Aluminum: 0.040 inch thick.
- B. Gutters and Downspouts:
 - 1. Gutters: Manufactured in uniform section lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish expansion joints, and expansion-joint covers.
 - a) Gutter Style: Rectangular
 - b) Aluminum: 0.040 inch (1.02 mm) thick.
 - c) Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
 - 2. Downspouts: Close-face rectangular with mitered elbows. Furnish wall brackets of same material and finish as downspouts, with anchors. Provide clean out at base.
 - a) Formed Aluminum: 0.050 inch thick.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement.
- B. Coat back side of aluminum roof specialties with bituminous coating where they will contact wood, ferrous metal, or cementitious construction.
- C. Separate dissimilar metals with a bituminous coating or polymer-modified, bituminous sheet underlayment.
- D. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- E. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless indicated.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install

- 1 expansion joint caps.
- 2 F. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener
- 3 manufacturer to achieve maximum pull-out resistance.
- 4 G. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports
- 5 spaced not more than 12 inches (305 mm) apart. Attach ends with rivets and seal with sealant to make watertight.
- 6 Slope to downspouts.
- 7 H. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners
- 8 designed to hold downspouts securely to walls and 1 inch (25mm) away from walls; locate fasteners at top and
- 9 bottom and at approximately 60 inches (1500 mm) o.c. Extend downspout into PVC drain underground. (6 inch
- 10 minimum).
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END OF SECTION 07 71 00

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**SECTION 07 92 00
JOINT SEALANTS**

PART 1- GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Environmental Limitations: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside limits permitted by joint- sealant manufacturer or are below 40 deg F (4.4 deg C).

PART 2 – PRODUCTS

2.1 JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Sealant for General Exterior Use Where Another Type Is Not Specified
 - 1. Single-component, neutral-curing silicone sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT.
- C. Sealant for Exterior Traffic-Bearing Joints, Where Slope Precludes Use of Pourable Sealant:
 - 1. Single-component, nonsag urethane sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use T.
- D. Sealant for Exterior Traffic-Bearing Joints, Where Slope Allows Use of Pourable Sealant:
 - 1. Single-component, pourable urethane sealant, ASTM C 920, Type S; Grade P; Class 25; for Use T.
- E. Sealant for Use in Interior Joints in Ceramic Tile and Other Hard Surfaces in Kitchens and Toilet Rooms and Around Plumbing Fixtures:
 - 1. Single-component, mildew-resistant silicone sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT; formulated with fungicide.

2.2 MISCELLANEOUS MATERIALS

- A. Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Closed Cell Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.
- D. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 1193.
- B. Install sealant backings to support sealants during application and to produce cross- sectional shapes and depths of installed sealants that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

END OF SECTION 07 92 00

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**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheets: ASTM A 1008/A 1008M, suitable for exposed applications.
- B. Hot-Rolled Steel Sheets: ASTM A 1011/A 1011M, free of scale, pitting, or surface defects.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G60 (Z180) or A60 (ZF180).
- D. Frame Anchors: Hot Dip-galvanized.

2.2 HOLLOW METAL DOORS

- A. Doors: Complying with ANSI 250.8 for level and model and ANSI A250.4 for physical- endurance level indicated, 1-3/4 inches (44 mm) thick unless otherwise indicated.
 - 1. Exterior Doors: Level 3 and Physical Performance Level A (Extra Heavy Duty) Model 2 (Seamless), metallic-coated steel sheet faces. Provide Top cap closure. Coordinate door panel size to provide a ¼ inch maximum gap between door bottom and the threshold.
 - 2. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as door face sheets.
 - 3. Thermal-Rated (Insulated) Doors: Where indicated, provide doors with thermal resistance value (R Value) of not less than R-7 when tested according to ASTM C 1363.
- B. Frames: ANSI A250.8; conceal fastenings unless otherwise indicated.
 - 1. Steel Sheet Thickness for Exterior Doors: 16 gauge.
 - 2. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
 - 3. Frame Anchors: Not less than 0.042 inch thick.
- C. Prepare doors receive mortised and concealed hardware according to ANSI A250.6 and ANSI A115 Series standards.
- D. Reinforce doors to receive surface-applied hardware.
- E. Prime Finish: Manufacturer's standard, factory-applied coat of lead and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install hollow metal frame to comply with ANSI/SDI A250.11
- B. Coordinate with aluminum frame supplier and install doors to provide clearances between doors and frames as indicated in ANSI/SDI A250.11.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying rust-inhibitive primer. Use galvanizing repair paint for metallic coated surfaces.
- D. Note: Hollow Metal door will receive high performance coating.

END OF SECTION 08 11 13

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**SECTION 08 17 43
COMPOSITE FIBERGLASS DOOR**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush Panel FRP Doors.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 08 71 00 - Door Hardware
- C. Section 08 41 13- Aluminum Framed Entrances and Storefronts

1.3 REFERENCES

- A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00s.
- B. Product Data:
 - 1. Submit manufacturer’s product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
- C. Shop Drawings:
 - 1. Submit manufacturer’s shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- D. Color Samples: Minimum size 6 inches (150 mm) by 6 inches (150 mm), representing actual product, color, and of finish for each finish product specified.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
 - 2. Door components must be fabricated by same manufacturer.
 - 3. Evidence of a documented complaint resolution quality management system.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery.
 - 1. Deliver materials to site in manufacturer’s original, unopened, containers and packaging.
 - 2. Labels clearly identifying opening, door mark, and manufacturer.
- B. Storage.
 - 1. Store materials in a clean, dry area, indoors in accordance with manufacturer’s instructions.
- C. Handling.
 - 1. Protect materials and finish from damage during handling and installation.

1.7 WARRANTY

- A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Standard Period.
 - 1. Ten years starting on date of shipment.
- C. Limited lifetime
 - 1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
- D. Finish
 - 1. SpecLite3® face sheets 10 years from the date of shipment.
 - 2. Painted AF-217, AF-150 frames, AF-250 frames: 3 years.

- 1 3. Thresholds do not have a finish warranty.

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3 **PART 2 PRODUCTS**

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5 **2.1 MANUFACTURERS**

- 6 A. Basis of Design for FRP Door
7 1. Special-Lite inc. or Approved Equal

8 **2.2 DESCRIPTION**

- 9 A. Model: AF-217 Pebble Grain Composite Fiberglass Door
10 1. Door Opening Size: See Drawings
11 B. Construction:
12 1. 1.75-inches (44 mm)
13 2. Stiles & Rails:
14 a) Pultruded fiberglass with integral channels for securing corner reinforcing clip.
15 3. Corners:
16 a) Mitered
17 b) Secured with pultruded fiberglass corner clip chemically welded to stiles and rails.
18 c) Mechanical fasteners to secure corner joints not acceptable.
19 C. Core:
20 1. PP Polypropylene Honeycomb.
21 a) 5.0 pcf density.
22 b) High strength to weight ratio.
23 c) Corrosion, fungi, rot, chemical and moisture resistant.
24 d) Sound and vibration dampening.
25 e) Energy absorbing and recyclable.
26 D. Face Sheet:
27 1. Exterior
28 a) 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
29 b) Color Black #5532.
30 c) Class C standard.
31 2. Interior
32 a) 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
33 b) Color Black #5532.
34 3. Attachment of face sheet.
35 a) Face sheets to be flame treated to promote durable, long lasting bond.
36 b) Face sheets adhered to stiles, rails, and core using hot melt adhesive evenly coated across all
37 surfaces to produce strong bond and prevent moisture absorption.
38 4. Hardware.
39 a) Pre-machine doors in accordance with templates from specified hardware manufacturers.
40 b) Surface mounted closures will be reinforced for but not prepped or installed at factory.
41 5. Reinforcements.
42 a) Solid high-density polyurethane shapes chemically welded to stiles, rails and/ or core.
43 b) No metallic reinforcements will be allowed.

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45 **PART 3 EXECUTION**

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47 **3.1 EXAMINATION**

- 48 A. Examine areas to receive doors.
49 B. Notify architect of conditions that would adversely affect installation or subsequent use.
50 C. Do not proceed with installation until unsatisfactory conditions are corrected.

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52 **3.2 PREPARATION**

- 53 A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

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55 **3.3 INSTALLATION**

- 56 A. Install doors in accordance with manufacturer's instructions.

- 1 B. Install doors plumb, level, square, true to line, and without warp or rack.
- 2 C. Anchor frames securely in place.
- 3 D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- 4 E. Set thresholds in bed of mastic and back seal.
- 5 F. Install exterior doors to be weathertight in closed position.
- 6 G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- 7 H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

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9 **3.4 CLEANING**

- 10 A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- 11 B. Do not use harsh cleaning materials or methods that would damage finish.

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13 **3.5 PROTECTION**

- 14 A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration
- 15 at time of substantial completion.

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and color Samples.

PART 2 – PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

- A. Basis of Design for Window Frame:
1. Kawneer Company Inc. or Approved Equal
 2. EnCORE™ Framing System (Thermally improved) at fixed window conditions.
 3. System Dimensions: 1-3/4" (44.5) x 3-9/16" (90.5)
 4. Glass: Exterior Structural Silicone Glazing
- B. Accessible Entrances: Comply with ICC/ANSI A117.1.
- C. Performance Requirements:
5. Limit deflection of framing members normal to wall plane to 1/175 of clear span for spans up to 13 feet 6 inches.
 6. Limit deflection of framing members parallel to glazing plane to L/360 of clear span or 1/8 inch, whichever is smaller.
 7. Structural Testing: Systems tested according to ASTM E 330 at 150 percent of inward and outward wind-load design pressures do not evidence material failures, structural distress, deflection failures, or permanent deformation of main framing members exceeding 0.2 percent of clear span.
 8. Air Infiltration: Limited to 0.06 cfm/sq. ft. of system surface area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
 9. Water Penetration: Systems do not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- D. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated; ASTM B 209 sheet; ASTM B 221 (ASTM B 221M) extrusions.
- E. Glazing: As specified in Division 08 Section "Glazing."
- F. Doors: See Section 08 11 13 Hollow Metal Doors
- G. Fasteners and Accessories: Compatible with adjacent materials, corrosion resistant, nonstaining, and nonbleeding. Use concealed fasteners except for application of door hardware.
- H. Fabrication: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
1. Door Framing: Reinforce to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units for hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
- I. Aluminum Finish: Fluoropolymer two-coat coating system complying with AAMA2604.
- J. Weather-strip: Provide standard weather-strip compatible with aluminum framing.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Isolate metal surfaces in contact with incompatible materials, including wood, by painting contact surfaces with bituminous coating or primer, or by applying sealant or tape recommended by manufacturer.
- B. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- C. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- D. Install framing components true in alignment with established lines and grades to the following tolerances:
1. Variation from Plane: Limit to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.

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2. Alignment: For surfaces abutting in line, limit offset to 1/16 inch (1.5 mm). For surfaces meeting at corners, limit offset to 1/32 inch (0.8 mm).
 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).
- E. Coordinate frame preparation with hollow metal door supplier and hardware requirements.

END OF SECTION 08 41 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Hardware schedule and keying schedule.
- B. Deliver keys to Owner.

PART 2 – PRODUCTS

2.1 HARDWARE

- A. Hinges:
 - 1. Ball bearing hinges
 - a) Basis of Design: Hager Co. BB1168 Heavy Weight Ball Bearing, Full Mortise
 - b) Finish: Satin Stainless Steel (630)
 - c) Stainless steel hinges with stainless steel pins.
 - d) Nonremovable hinge pins for exterior and public interior exposure.
 - e) Ball-bearing hinges on interior doors.
 - f) 3 hinges for 1-3/4 inch (45 mm) thick doors 90 inches (2300 mm) or less in height; 4 hinges for doors more than 90 inches (2300 mm) in height.
 - 2. Continuous hinges
 - a) Continuous hinges on all FRP doors.
 - b) Finish: Satin Stainless Steel (630)
- B. Locksets and Latch Sets:
 - 1. L-1 – Schlage L Series Mortise Mechanical
 - a) Lock Grade: 1
 - b) Function: Storeroom (L9080) - Latchbolt operated by key outside or by lever inside. Outside lever always inoperable. Auxiliary deadlatch.
 - c) Cylinder: Conventional 6-pin full-face cylinder (P)
 - d) Lever Style: Standard Collection 03
 - e) Escutcheon: N Full Face
 - f) Rose: Style A
 - g) Finish: Satin Stainless Steel (630)
 - 2. L-2 – Schlage L Series Mortise Mechanical
 - a) Lock Grade: 1
 - b) Function: Classroom (L9070) - Latchbolt retracted by lever/knob from either side unless outside lever is locked by key. Unlocked from outside by key. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever always free for immediate egress.
 - c) Cylinder: Conventional 6-pin full-face cylinder (P)
 - d) Lever Style: Standard Collection 03
 - e) Escutcheon: N Full Face
 - f) Rose: A
 - g) Finish: Satin Stainless Steel (630).
 - 3. L-3 – Schlage Small format interchangeable rim cylinder for exit device
 - a) 80-129 - Less core (Cylinder housing only)
 - b) To be keyed by owner.
 - c) Finish: Satin Chrome (626)
- C. Key locks to Owner's master-key system.
 - 1. Cylinders with six-pin tumblers.
- D. Closers:
 - 1. Mount closers on interior side (room side) of door opening. Provide regular-arm, parallel-arm, or top-jamb-mounted closers as necessary.

- 1
2. Adjustable delayed opening (accessible to people with disabilities) feature on closers.
- 2
3. Basis of Design: LCN 4040XP Series
- 3
4. C-1 – LCN 4040XP
- 4
- a) Cush-N-Stop (CUSH) Arm.
- 5
- b) Mount closer on interior face of door panel.
- 6
- c) Finish: Painted Black.
- 7
5. C-2 – LCN 4040XP
- 8
- a) Hold Open Cush-N-Stop (HCUSH) Arm.
- 9
- b) Mount closer on interior face of door panel.
- 10
- c) Handle controls hold open function.
- 11
- d) Finish: Painted Black.
- 12
- e) Locate on active leaf (only).
- 13
- E. Wall door stops for doors without closers.
- 14
- F. Protection Plates (Kick Plate):
- 15
1. Basis of Design: Ives 8400 Series Kickplate
- 16
- a) Height: 10 inches
- 17
- b) Width: 34 inches
- 18
- c) Finish: Satin Stainless Steel (630)
- 19
- d) Locate on push side of door.
- 20
- G. Weatherstrips, Thresholds & Door Bottoms:
- 21
1. Weatherstrip (Aluminum Frame Condition):
- 22
- a) As supplied by aluminum frame supplier.
- 23
2. Weatherstrip (Hollow Metal Frame Condition):
- 24
- a) Basis of Design: Reese Model 775
- 25
- b) Finish: C - Clear Anodized Aluminum
- 26
- c) Polyurethane Insert.
- 27
3. Thresholds:
- 28
- a) Basis of Design: Reese Model 2125SS Saddle Threshold
- 29
- b) Finish: 10 gauge #304 Stainless Steel alloy in a mill finish.
- 30
- c) Width/Depth: 5 inches (127 mm) wide, 1/2 inch (12.7 mm) deep.
- 31
4. Sweeps:
- 32
- a) Basis of Design: Reese Model 701
- 33
- b) Finish: C - Clear Anodized Aluminum
- 34
- c) Polyurethane Insert.
- 35
- H. Electric Strike:
- 36
1. Assa Abloy HES 9600 Surface mounted heavy duty electric rim strike.
- 37
2. 24 volt capability and supplied standard as fail-secure unless otherwise specified.
- 38
3. Provide electric strikes with in-line power controller / supply and surge suppressor by the same manufacturer
- 39
- as the strike with the combined products having a five year warranty.
- 40
4. Provide all necessary conduit and wiring back to control panel in Mechanical Room for complete system.
- 41
5. Finish: Satin Stainless Steel (630)
- 42
- I. Exit Device:
- 43
1. Von Duprin 98/99 series high-performance heavy-duty exit device
- 44
2. Series 98-Smooth
- 45
3. Device Type / Function: Rim Device, Night Latch (NL)
- 46
4. Device Finish: Satin Stainless Steel (630)
- 47
5. Trim: 990NL - Night Latch - Key retracts latch
- 48
6. Trim Finish: Satin Stainless Steel (630)
- 49
- J. Flush Bolts:
- 50
1. Basis of Design: Ives - Manual Flush Bolt

- 1 a) Model: FB457 Top & Bottom
- 2 b) Finish: Satin Chrome (US26D)
- 3 c) Locate on inactive leaf (only).
- 4 B. Astragal on active leaf by door manufacturer.
- 5

6 **PART 3 – EXECUTION**

7

8 **3.1 INSTALLATION**

- 9 A. Mount hardware in locations recommended by the Door and Hardware Institute unless otherwise indicated.

10

11 **3.2 HARDWARE SCHEDULE**

- 12 A. Hardware Set No. HS-1 (Exterior Door to Toilets):
- 13 1. Continuous Hinges
 - 14 2. Lock Set L-3
 - 15 3. Protection Plate (Push Side)
 - 16 4. Closer C-1
 - 17 5. Threshold
 - 18 6. Door Sweep
 - 19 7. Weatherstrip (By Aluminum Frame Supplier)
 - 20 8. Electric Strike
 - 21 9. Exit Device
- 22 B. Hardware Set No. HS-2 (Exterior Door to Mechanical):
- 23 1. Continuous Hinges.
 - 24 2. Lock Set L-2
 - 25 3. Closer C-1
 - 26 4. Protection Plate (Push Side)
 - 27 5. Threshold
 - 28 6. Door Sweep
 - 29 7. Weatherstrip (By Aluminum Frame Supplier)
- 30 C. Hardware Set No. HS-4 (Interior Door to Mechanical):
- 31 1. Ball Bearing Hinges
 - 32 2. Lock Set L-1
 - 33 3. Threshold
 - 34 4. Door Sweep
 - 35 5. Wall Door Stop
 - 36 6. Weatherstrip (for Hollow Metal Frame)
 - 37

38 **END OF SECTION 08 71 00**

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**SECTION 08 80 00
GLAZING**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and 12 inch square Samples.
- B. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated.
 - 1. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 2. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- D. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

PART 2 – PRODUCTS

2.1 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3.
- B. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II, Class 1 (clear), Form 3; Quality-Q6. Provide frosted finish, frost finish to be interior.

2.2 INSULATED-GLASS TYPES

- A. Glass Type [GL-1]: Low-E coated tempered insulated glass unit. Basis of Design: PPG Solarban 60
 - 1. Overall Unit Thickness: 1" with each glass lite 1/4"
 - 2. Outboard glass: Fully tempered with frosted finish on #2 surface.
 - 3. Interspace Content: Argon
 - 4. Inboard Glass: Fully tempered with low-E coating on #3 surface.
 - 5. Winter Nighttime U-Factor: 0.29 Max
 - 6. Summer Daytime U-Factor: 0.27 Max
 - 7. Solar Heat Gain Coefficient (SHGC): 0.38 Max

2.3 GLAZING SEALANTS

- A. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are contained in GANA's "Glazing Manual."
- B. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- C. Remove nonpermanent labels, and clean surfaces immediately after installation.

END OF SECTION 08 80 00

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SECTION 09 29 00
GYPSUM BOARD

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 – PRODUCTS

2.1 PANEL PRODUCTS

- A. Provide in maximum lengths available to minimize end-to-end butt joints.
B. Water-Resistant Gypsum Ceiling Board (toilet Rooms 102 & 103): ASTM C 630/C 630M or ASTM C 1396/C 1396M, in thickness indicated. Regular type unless otherwise indicated.
C. Cementitious Backer Units: ANSI A118.9. (Mechanical 101 Ceiling)

2.2 ACCESSORIES

- A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet. For exterior trim, use accessories formed from hot-dip galvanized-steel sheet, plastic, or rolled zinc.
1. Provide cornerbead at outside corners unless otherwise indicated.
2. Provide LC-bead (J-bead) at exposed panel edges.
3. Provide control joints where indicated.
B. Joint-Treatment Materials: ASTM C 475/C 475M.
1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
2. Joint Compounds: Use setting-type compounds at exterior soffits.
3. Cementitious Backer Unit Joint-Treatment Materials: Products recommended by cementitious backer unit manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install gypsum board to comply with ASTM C 840.
1. Isolate gypsum board assemblies from abutting structural and masonry work. Provide edge trim and acoustical sealant.
2. Single-Layer Fastening Methods: Fasten gypsum panels to supports with screws.
B. Install cementitious backer units to comply with ANSI A108.11.
C. Finishing Gypsum Board: ASTM C 840.
1. At concealed areas, unless a higher level of finish is required for fire-resistance- rated assemblies, provide Level 1 finish: Embed tape at joints.
2. Unless otherwise indicated, provide Level 4 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.
D. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

END OF SECTION 09 29 00

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**SECTION 09 67 23
RESINOUS FLOORING**

PART 1 – GENERAL

1.1 QUALITY ASSURANCE

- A. Single Source Responsibility-Obtain primary resinous floor materials including hardening agents, finish or sealing coats from a single manufacturer with not less than 5 years of successful experience in manufacturing and installing the principal materials described in this section. Provide secondary materials only of type and from a source recommended by the manufacturer of the primary material.
- B. Manufacturer Supervision: A representative of the materials manufacturer shall be present on site periodically for all phases of the installation of the specified coating materials. A minimum of one (1) visit for every 1000 square feet of application is required.
- C. Application Bond Testing: The manufacturer shall conduct bond testing of the materials a minimum one (1) of every 1000 square of application and document acceptability to manufacturer.
- D. Flooring supplier is to conduct moisture testing of the concrete floor slab – 1 per 1000 sf of floor or at least 1 per room whichever is more. Test as per flooring manufactures recommendation. Provide owner and architect written results and test process. Provide flooring manufacturers acceptable moisture limits to compare with test results.
- E. Core Sampling: At the discretion, direction and expense of the Division of State Facilities, core sampling may be required by the contractor and/or manufacturer.

1.2 SUBSTITUTIONS

- A. Contractors, applicators, or manufacturers that do not meet the requirements of the Bidding Requirements or this section must submit their requests for approval to the Architect for review a minimum of 14 days prior to bid opening. Any requests subsequent to that date will not be considered. Approved substitutions will be included in addendum only.

1.3 SUBMITTALS

- A. Submittals required prior to contract award:
 - 1. Letter of training certification from the manufacturer/distributor stating that contractor is an approved installer of the products specified in this Section.
 - 2. Submit written description of experience illustrating conformance with the Letter of Solicitation – Contractor Qualifications, include project Owners, contact names, and phone numbers.
 - 3. Submit resumes on key personnel who will be performing the actual work.
 - 4. Submittals shall be delivered to Project Manager prior to or at Pre-Construction Conference and shall include at a minimum:
 - a. Submit three (3) copies and (1) digital copy of manufacturer’s product literature indicating technical data including accessory materials.
 - b. Submit three (3) copies of manufacturer’s installation and application guide.
 - c. Submit three (3) copies of manufacturer’s color palatte for agency color selection.
 - d. Submit three (3) samples of finished product on 12 inch by 12 inch (12” x 12”)
 - e. Submit three (3) copies of manufacturer’s Material Safety DataSheets.
 - f. Construction Submittals: One (1) digital of application bond test or core test results to Architect within seventy-two hours of test.

1.4 REFERENCES

- A. References: Cited Standards are incorporated herein by reference and govern the work Pamphlet No. 03732, International Concrete Repair Institute, (Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays).

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of materials: Deliver materials to project site with labels legible and intact.
- B. Include and maintain labels on containers displaying the following information: Manufacturer’s name, Product name, Product number, Color, Instructions for reducing (where applicable) and Component description.
- C. Storage of materials: Bulk, prolonged storage of materials at application location will not be allowed. See General Requirement, Special Site Conditions for further requirements.

1 **1.6 JOB CONDITIONS**

2 A. Environmental requirements

- 3 1. Comply with manufacturer's recommendations as to environmental conditions under which floor-coating
4 systems can be applied.
- 5 2. Do not apply flooring system at temperatures beyond those limits stated in the manufacturer's technical data
6 sheet unless given written permission by the manufacturer.
- 7 3. Do not apply flooring system in areas where dust or other airborne particulate matter is being generated.
- 8 4. Protection: Cover or otherwise protect finished work of other trades and surfaces not being coated
9 concurrently or not to be coated.

10
11 **1.7 WARRANTY**

- 12 A. Provide written manufacturer's (NDL) no-dollar-limit warranty covering coating system workmanship of the coating
13 and other system components supplied by the manufacturer for a period of three (3) years from date of installation.
- 14 B. Note: Warranty may not contain clause(s) voiding warranty due to contractor solvency, improper workmanship,
15 contractor error, or contractor failure to follow manufacturer specification(s) and requirements to obtain the
16 warranty requested by this project.

17
18 **PART 2 – PRODUCTS**

19
20 **2.1 FLOORING SYSTEM**

- 21 A. Description: Medium to heavy duty, minimum 1/8" base overall thickness with integral cove base, slip resistant,
22 aggregate filled, 100% solids epoxy flooring system, including, antimicrobial treatment, and urethane coat finish as
23 follows:
- 24 B. System Materials:
- 25 1. Finish areas designated by Architect.
- 26 2. Broadcast Coats: 100% Solids, two (2) epoxy resin coats, 1/16" including color pigments and minimum 1/8"
27 thickness
- 28 3. Aggregate: Color Granules. Color: As selected by Architect from Full Unicolors Palette
- 29 4. Topcoat: 95% solids minimum, urethane resin topcoat complying with the American with Disabilities Act
30 coefficient of friction with necessary anti-slip resistance additives and a minimum thickness of 15 mils.
- 31 C. Approved Manufactures:
- 32 1. Dur-A-Flex, Inc or Approved Equal
- 33 2. (Dur-A-Flex Accelera-HQ)
- 34 D. Colors: Dur-A-Flex color Q28-35 or Approved Equal. Colors shall be selected by the Architect from manufacturer's full
35 palette of colors.
- 36 E. Mixing: Comply in strict accordance with manufacturer's requirements for mixing and handling of all materials.
- 37 F. Do not apply any material that has exceeded shelf and pot life as determined by manufacturer.

38
39 **2.2 MISCELLANEOUS MATERIALS**

- 40 A. Grouts / Mortars: Polymer Modified, Cementitious Patch, capable of feather edge application and as approved by the
41 flowing system manufacturer for use within their system.
- 42 B. Sealants: Epoxy sealants as approved for use by this manufacturer. Metal low profile transition strips: 304 stainless
43 steel transition strip.

44
45 **PART 3 – EXECUTION**

46
47 **3.1 INSPECTION**

- 48 A. General: The Contractor and Manufacturer shall take sole responsibility for review and determination of the job
49 conditions prior to application of any products.
- 50 B. Selected resinous floor system shall be applied over concrete slab, ground to profile as recommended by the selected
51 manufacturer. Prior to system application, the concrete surface shall be free of laitance, form release agents, curing
52 agents, oil, grease and other contaminants. Surface shall be free of fins, projections, and loosely adhering concrete,
53 dirt and dust particles.
- 54 C. Examine surfaces scheduled to receive coating for conditions that will adversely affect execution, permanence or
55 quality of work and which cannot be put into an acceptable condition through preparatory work as included herein.
- 56 D. Notify Architect immediately upon determination that surfaces to receive coating are unacceptable for proper

- 1 adhesion or subsequent performance.
2 E. Do not proceed with surface preparation or coating application until conditions are suitable.
3
4 **3.2 PREPARATION OF SURFACES**
5 A. General: Concrete surfaces shall be free of visible moisture, oil, grease, curing
6 B. compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, bituminous products, or any other
7 contaminants that will affect long term adhesion of the flooring system.
8 C. Moisture Content: Strictly comply with the manufacturer's requirements for evaluation / testing of moisture content.
9 Under any circumstances, do not apply high performance floor coatings to floor slabs that exceed 5 percent moisture
10 content or 3 pounds per 1,000 square feet per 24 hours per ASTM F 1869 Moisture Vapor Emission Rate.
11 D. Other Contamination: Conduct Litmus Test for pH to determine the presence of chloride or acid is within the limits of
12 the manufacturer's requirements.
13 E. Miscellaneous Repair Work:
14 F. Complete all concrete crack, spalling, deterioration, or damage as required by manufacturer to achieve approved
15 surface for application.
16 G. Install new, floor to wall cants and prep wall base to receive coved resinous base up 6", provide straight even top
17 edge.
18
19 **3.3 APPLICATION**
20 A. General Requirements: Comply in strict accordance with manufacturer's requirements application of all materials
21 including but not limited to moisture content, pH balance, environmental requirements, means and methods.
22 B. Install low profile transition strip at each point of resinous floor finish termination.
23
24 **3.4 INSPECTIONS**
25 A. Architect and/or Owner shall review work of this section for visual and textural acceptability only. Said review of
26 finished surfaces will be made at the discretion of the Architect and/or Owner prior to occupancy of Agency.
27 B. The Contractor and Manufacturer are solely responsible for quality assurance, application compliance, means and
28 methods.
29
30 **3.5 FINISHED WORK**
31 A. Damage to finished surfaces caused by other than coating contractor shall be repaired to acceptable condition by
32 coating contractor under cost reimbursement by GC if damage occurs prior to occupancy.
33 B. The Contractor shall refinish, repair, or replace areas where any portion of finish has been damaged or is not
34 acceptable. If refinish, repair, or replacement of any area does not produce uniformity of overall function,
35 performance, appearance or texture of the system, it is at the discretion of the Owner to require rework.
36
37 **3.6 CLEANING**
38 A. Remove debris promptly from work area and dispose of properly. Cleaning is to be done daily.
39 B. Remove spilled, splashed or splattered coating materials from all surfaces. Do not mar surface finish of items being
40 cleaned.
41 C. Clean existing building components within the limits of the work area including but not limited to walls, ceilings,
42 fixtures, and floors resulting release of dust or debris from floor preparation activities.
43 D. See General Requirements, Cleaning and Disposal for further requirements.
44
45 **END OF SECTION 09 67 23**

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**SECTION 09 96 00
HIGH-PERFORMANCE COATINGS**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data. Include printout of MPI's "MPI Approved Products List" with product highlighted.
 - 2. Samples.
- B. Mockups: Full-coat finish Sample of each type of coating, color, and substrate, applied where directed.
- C. Extra Materials: Deliver to Owner 1 gal. (3.8 L) of each color and type of finish coat used on Project, in containers, properly labeled and sealed.

PART 2 – PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS

- A. Products:
 - 1. Tnemec: Company Incorporated
- B. MPI Standards: Provide materials that comply with MPI standards indicated and listed in its "MPI Approved Products List."
- C. Material Compatibility: Provide materials that are compatible with one another and with substrates.
 - 1. For each coat in a system, provide products recommended in writing by manufacturers of topcoat for use in system and on substrate indicated.
- D. Colors: As selected by Architect from manufacturers full line.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, lighting fixtures, and similar items that are not to be coated. Mask items that cannot be removed. Reinstall items in each area after coating work is complete.
- C. Clean and prepare surfaces in an area before beginning coating work in that area. Schedule work so cleaning operations will not damage newly coated surfaces.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.

3.2 APPLICATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Coat exposed surfaces, new unless otherwise indicated.
 - 1. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 2. Coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat the back side of access panels.
 - 4. Do not coat prefinished items, items with an integral finish, operating parts, and labels unless otherwise indicated.
- C. Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use brushes only where the use of other applicators is not practical.
- D. Apply high-performance coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 - 1. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform finish, color, and appearance.

3.3 EXTERIOR COATING APPLICATION SCHEDULE

- A. Steel:
 - 1. Gloss Epoxy Coating System: Two coat(s) over epoxy primer: MPI EXT 5.1F.

- 1 B. Galvanized Metal:
2 1. Gloss Epoxy Coating System: Two coat(s) over epoxy primer: MPI EXT 5.3C.
3
4 **3.4 INTERIOR COATING APPLICATION SCHEDULE**
5 A. Concrete Masonry Units:
6 1. Water-Based Epoxy Coating System: Two coat(s) over latex block filler: MPI EXT 4.2J.
7 B. Steel:
8 1. Water-Based Epoxy Coating System: Two coats over primer: MPI INT 5.1E.
9 C. Gypsum Board:
10 1. Water-Based Epoxy Coating System: Two coats over primer: MPI INT 9.2F.
11
12

END OF SECTION 09 96 00

**SECTION 09 96 01
MASONRY WEATHER SEAL AND GRAFFITI BLOCK**

PART 1 – GENERAL

1.1 SCOPE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial masonry sealant and graffiti coating for exposed Masonry.
- B. Related Sections include the following:
 - 1. Section 99700: Coatings for Masonry

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Warranty: Special warranty specified in this Section.
- C. ANSI: Upon request by A/E, provide hardware manufactures' letters of compliance that their products meet specified ANSI standards and that they have been tested and meet grades specified.

1.4 QUALITY ASSURANCE

- A. General: Products have been specified by manufacturer's name, brand, and catalog numbers for the purpose of establishing a basis for quality, finish, design, and operational function.
- B. Supplier Qualifications: Supplier furnishing products in the vicinity for a period of not less than 5 years. This supplier shall have experience in the preparation of architectural coatings specifications, estimating, detailing, ordering, servicing of architectural products in all its branches and will be available at reasonable times during the course of the work for project hardware consultation to the Owner, A/E, and GC.
- C. Supplier's principal office shall be located within a 100 mile radius of the Project Site.
- D. Prepare a Test Area: in agreed upon location, a minimum 4ft by 4ft area on each type of masonry. Use the manufacturer's application instructions. Let protective treatment test area cure before inspection. Keep test panels available for comparison throughout the protective treatment project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. The GC or contractor of his choice will receive the products when delivered at the job site. A dry locked storage space complete with shelving, will be provided for the purpose of unpacking, sorting out, checking and storage.
- B. Direct factory shipments to the job site not acceptable. Promptly replace items damaged in shipment with proper material without additional cost.
- C. Handle product in a manner to minimize damage.

1.6 OWNERS INSTRUCTIONS

- A. Upon completion of hardware installation, assist the GC in instructing Owner in maintenance of all products and other work of this Section.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace defective product.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive cracking, fading, peeling, etc.
 - b. Deterioration of finish from UV exposure or Graffiti removal process.

PART 2 – PRODUCTS

2.1 MASONRY SEALANT AND GRAFFITI CONTROL COATING

1
2 **2.2 MANUFACTURER:**

- 3 A. PROSCO, Inc.
4 3741 Greenway Circle, Lawrence, KS 66046.
5 Phone (800) 255-4255; Fax (785) 830-9797.
6 E-mail: CustomerCare@proscocom
7

8 **2.3 PRODUCT DESCRIPTION:**

9 *Sure-Klean® Weather Seal Blok-Guard® & Graffiti Control II* is a clear-drying, water-based silicone emulsion for
10 weatherproofing concrete block and other porous masonry materials and protecting them from graffiti attacks without
11 altering the natural appearance. *Blok-Guard® & Graffiti Control II* is appropriate for interior and exterior use. *Blok-*
12 *Guard® & Graffiti Control II* is easy to apply with low-pressure spray, brush or roller, and protects exterior walls exposed to
13 normal weathering. Graffiti removal from treated surfaces is fast and easy using Defacer Eraser® Graffiti Wipe.

14 A. TYPICAL TECHNICAL DATA:

- 15 1. FORM: Milky White Liquid
16 2. SPECIFIC GRAVITY: 1.00
17 3. pH: n/a
18 4. WEIGHT / GALLON: 3.82 LBS
19 5. ACTIVE CONTENT: 6 %
20 6. TOTAL SOLIDS: 6% ASTM D 5095
21 7. FLASH POINT: greater than 212 degrees F (>100 degrees C)
22 8. FREEZE POINT: 32 degrees F (0 degrees C)
23 9. SHELF LIFE: 1-year in tightly sealed, unopened container
24 10. VOC CONTENT: less than 20g/L, Low Solids Coating. Complies with all known federal, state and district AIM
25 VOC Standards.

26 B. LIMITATIONS:

- 27 1. Not suitable for extremely dense or polished surfaces.
28 2. Not appropriate for application to asphaltic or painted surfaces.
29 3. Not suitable for application to synthetic resin paints, gypsum, plaster or other non-masonry surfaces.
30 4. Not recommended for below-grade applications.
31 5. Will not prevent water preparation through structural cracks, defects, or open joints.
32 6. May darken or enhance the natural color of some surfaces. Always protect.
33 7. Not recommended for horizontal surface.
34

35 **PART 3 – EXECUTION**

36
37 **3.1 APPLICATION:**

38 Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for
39 *Weather Seal Blok-Guard® & Graffiti Control II*. Refer to the Product Data Sheet for additional information about
40 application of *Blok-Guard® & Graffiti Control II*. Do not dilute or alter.
41

42 For Best results, apply *Blok-Guard® & Graffiti Control II* "wet-on-wet" to a visibly dry and absorbent surface.

43 A. SPRAY:

- 44 1. Using low-pressure (<50 psi) spray equipment, saturate, "wet-on-wet" spraying from the bottom up. Avoid
45 excessive overlapping. For textured and porous surfaces, apply enough material to create 6 to 8 inch rundown
46 below the contact point.
47 2. Let first application penetrate masonry surface for 2 to 3 minutes. For textured and porous surfaces, reapply
48 in same saturating manner to ensure complete coverage of recessed surfaces.
49 3. Immediately brush out runs and drips to prevent build-up.

- 50 B. BRUSH or ROLLER APPLICATION: Saturate uniformly. Let product penetrate for 2-3 minutes. Re-saturate. Brush out
51 heavy runs and drips that do not penetrate.

- C. DENSE, SMOOTH SURFACE APPLICATION: Apply a single coat. Use enough to completely wet the surface without creating drips, puddles or rundown. Do not over apply. Test for application rate.
- D. SECOND COAT / POROUS SURFACES APPLICATION: Some surfaces will need an additional coat of *Blok-Guard®* & *Graffiti Control II* for maximum protection. Apply the second wet-on-wet coat as soon as the first application is dry to the touch or within one hour. Allowing more than one hour between coats could reduce the effectiveness of the second coat or causedarkening.

3.2 DRYING TIME:

In normal weather (60-80 degrees F; [16-27 degrees C] 50% humidity), *Blok-Guard®* & *Graffiti Control II* dries to the touch in about 1 hour. Drying takes longer at lower temperatures.

Blok-Guard® & *Graffiti Control II* gains its weather repellency properties in 24 hours. Protect treated surfaces from rain for at least 6 hours after application.

3.3 CLEANUP:

Clean tools, equipment and over-spray with soap and warm water. Cleanup is more difficult from surfaces hotter than 95 degrees F (35 degrees C).

3.4 GRAFFITI REMOVAL:

Remove most types of graffiti with PROSCO'S Defacer *Eraser® Graffiti Wipe* or *Enviro Klean® SafStrip®*. See product literature or call Customer Care at 800-255-4255.

3.5 BEST PRACTICES:

- A. Surface should be clean, dry and absorbent before application.
- B. Clean soiled surface with the appropriate *Sure-Klean®* or *Enviro-Klean®* cleaner before application. Call Customer Care at 800-255-4255 for recommendations.
- C. Preferred method of application is low-pressure (<50 psi) spray equipment. Use fan-type spray tip and adjust pressure to avoid atomization of the material.
- D. Apply evenly. Saturate the surface but do not over apply. Brush out runs and drips.
- E. On dense surfaces, follow the "Dense Smooth Application Instructions" on page 2.
- F. A second application may be needed on highly porous masonry. Apply the second coat within one hour or as soon after the first is dry to the touch.
- G. ALWAYS TEST for best coverage rates and confirm results before overall application. Test using the application instructions included herein. Let the test area dry thoroughly before inspection.
- H. Never go it alone. If you have problems or questions, contact your local PROSCO distributor or field representative. Or call PROSCO Technical Customer Care Center, toll-free, at 800-255-4255.

PART 4 - SAFETY INFORMATION:

Sure Klean® Weather Blok-Guard® Graffiti Crontrrol II is a water carried product. Use appropriate safety equipment and job site controls. Read the full label and MSDS for precautionary instructions before use.

A. FIRST AID: 24 Hour Emergency Information – INFOTRAC at 800-535-5053

1. Ingestion: Call a physician, emergency room or poison control center immediately. Do not induce vomiting. If vomiting occurs, keep victims head lower to avoid aspiration. Get medical assistance.
2. Eye Contact: Rinse thoroughly for 15 minutes. Get immediate medical assistance.
3. Skin Contact: Remove contaminated clothing and rinse thoroughly for 15 minutes. Seek medical assistance in persistent irritation develops. Launder contaminated clothing before reuse.
4. Inhalation: Seek medical attention if irritation develops. If you experience dizziness or nausea, get to fresh air. Seek medical assistance if symptoms persist.

END OF SECTION 09 96 01

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**SECTION 10 14 00
SIGNAGE**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and Samples.
- B. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 – PRODUCTS

- A. Exterior signage for restrooms.
 - 1. Acrylic panels matte-finished. Provide solid general contrasting color to the white letters and graphic symbols.
 - 2. Provide sign for:
 - a) MEN (include both a male graphic and accessible symbol above letters and braille under letters)
 - b) WOMEN (include both a female graphic and accessible symbol above letters and braille under letters)
 - c) Letters to be 3/4" Arial font.
 - d) Male and Female Graphic to be ±5" tall.
 - e) Accessible symbol ±4" tall.
 - f) Braille to comply with ADA regulations.
 - 3. Finishes and Colors: As selected from manufacturer's full range.
- B. Address numbers.
 - 1. Brass or aluminum powder coated black.
 - a. Letters to be 6" tall Arial font. (or eq)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Locate signs where indicated or directed by Architect. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- B. Wall-Mounted Signs:
 - 1. Mechanical Fasteners: Use non-removable stainless steel mechanical fasteners placed through predrilled holes.
 - 2. Locate signs to comply with ADA regulations.

END OF SECTION 10 14 00

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**SECTION 10 21 13
TOILET COMPARTMENTS**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and Samples.
- B. Regulatory Requirements: Comply with ICC/ANSI A117.1 for toilet compartments designated as accessible.

PART 2 – PRODUCTS

2.1 TOILET COMPARTMENTS AND SCREENS

- A. Products:
 - 1. Basis of Design: Bradley Phenolic-Series 700 High density polyethylene (HDPE)

2.2 MATERIALS

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface and with minimum 1-inch- (25 mm-) thick doors and pilasters and minimum 1-inch- (25 mm-) thick panels and screens.
 - 1. Color: As selected by Architects from manufactures line.
- B. Pilaster Shoes and Sleeves (Caps): Stainless steel not less than 4 inches high.
- C. Brackets: Continuous.
 - 1. Material: Stainless steel

2.2 FABRICATION

- A. Toilet Compartments: Floor and ceiling anchored.
- B. Urinal Screens: Wall hung.
- C. Doors: Unless otherwise indicated, 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.
- D. Door Hardware: Stainless steel. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
 - 1. Hinges: Continuous type, adjustable to hold door open at any angle up to 90 degrees.
 - 2. Latches and Keepers: Surface-mounted unit designed for emergency access and with combination rubber-faced door strike and keeper.
 - 3. Coat Hook: Combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 - 4. Door Pull: Provide at out-swinging doors. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install units rigid, straight, level, and plumb, with not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Provide brackets, pilaster shoes, bracing, and other components required for a complete installation. Use theft-resistant exposed fasteners finished to match hardware. Use sleeve nuts for through-bolt applications.
 - 1. Stirrup Brackets: Align brackets at pilasters with brackets at walls. Locate full length continuous wall brackets level and square so holes for wall anchors occur in masonry or tile joints.
 - 2. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

END OF SECTION 10 21 13

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**SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, ASTM B 16 (ASTM B 16M), or ASTM B 30.
- C. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T6 or 6463-T6.
- D. Sheet Steel: ASTM A 1008/A 1008M, 0.0359-inch (0.9-mm) minimum nominal thickness.
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- F. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.2 TOILET AND BATH ACCESSORIES

- A. Toilet Tissue Dispenser:
1. Basis-of-Design Product: Royce Rolls Ringer Co. Model # STP
 2. Type: Double-roll dispenser with paddle lock feature.
 3. Mounting: Surface mounted with concealed anchorage
 4. Material: Stainless steel.
 5. Operation: Controlled delivery
 6. Capacity: Designed for 4-1/2- or 5-inch- diameter-core tissue rolls.
- B. Liquid-Soap Dispenser:
1. (Supplied by Owner installed by Contractor.)
- C. Grab Bar:
1. Material: Stainless steel, 0.050 inch (1.3 mm) thick.
 2. Mounting: Concealed.
 3. Gripping Surfaces: Smooth, satin finish.
 4. Outside Diameter: 1-1/2 inches (38 mm) for heavy-duty applications.
- D. Sanitary Napkin Disposal Unit:
1. Basis-of-Design Product: Royce Rolls Ringer Co. Model # SNR
 2. Mounting: Surface.
 3. Material: Stainless steel, No. 4 finish (satin).
 4. Door or Cover: Self-closing.
 5. Receptacle: Removable.
- E. Mirror Unit:
1. Basis-of-Design Product: American Specialties, Inc. Stainless Steel Inter-Lock Angle Frame 0600 Series
 2. Model: 0600-C2436 Stainless Steel w/ #8 Mirror Finish
 3. Mounting: Surface Mounted
- F. Warm-Air Dryer:
1. Basis-of-Design Product: Excel Model HO-1W
 2. Type: Electronic-sensor activated.
 3. Mounting: Surface.
 4. Material: Steel, with white epoxy finish

1 **PART 3 – EXECUTION**

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3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.
- B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 10 28 00

**SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. It is the intent of these specifications to provide complete and workable plumbing systems as shown on the accompanying plans and as specified herein except such parts as are specifically exempted herein. Provide all necessary supervision, coordination, labor, materials, equipment, fixtures, drayage, hoisting, tools, transportation, plant services and facilities, machinery and connections to utilities for the installation of complete and operable plumbing systems. If details or special conditions are required in addition to those shown on drawings, provide all material and equipment usually furnished with such systems or required to complete their installation, whether noted in plans and specification or not.
- B. Materials and labor shall be new (unless noted otherwise), first class and workmanlike and shall be subject at all times to the A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.
- C. The layout shown on the drawings is diagrammatic but shall be followed as closely as other work will permit. The drawings provide design intent. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. Because of the scale of the Drawings, certain basic items, such as, pipe fittings, duct fittings, access panels, and sleeves, may not be shown. Where such items are required by Code or by other Sections, or where required for proper installation of the Work, such items shall be included, whether shown or not.
- E. In the event of any inconsistencies between the specifications, drawings, contract documents, applicable laws, statutes, ordinances, building codes, rules and regulations, the contractor shall provide the better quality or greater quantity of work and comply with or conform its work to the most stringent legal or contractual requirements.
- F. Changes from these drawings required to make this work conform to the building construction shall be made only with prior written approval of the Architect/Engineer. All proposed changes shall be shown on shop drawings. All measurements shall be verified by actual observation and all work shall fit in place meeting the approval of the Architect/Engineer.
- G. Equipment Specification may not deal individually with minute items required, such as, components, parts, controls, and devices which may be required to produce the equipment performance specified or as required to meet the equipment warranties. Where such items are required to make the system operational, they shall be included by the supplier of the equipment at no additional cost, whether or not specifically called for.

1.02 SECTION INCLUDES

- A. This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections.
 - 1. Submittals
 - 2. Reference Standards
 - 3. Quality Assurance
 - 4. Lead Free Requirements
 - 5. Guarantee
 - 6. Operation And Maintenance Instructions
 - 7. Record Documents
 - 8. Continuity Of Existing Services
 - 9. Protection Of Finished Surfaces
 - 10. Sealing And Firestopping
 - 11. Off Site Storage
 - 12. Regulatory Requirements
 - 13. Certificates And Inspections
 - 14. Coordination

15. Demolition And Existing Requirements
16. Request And Certification For Payment
17. Sleeves And Openings
18. Omissions
19. Definitions
20. Project/Site Conditions
21. Work Sequence And Scheduling
22. Salvage Materials
23. Training
24. Access Panels And Doors
25. Identification
26. Bedding And Backfill
27. Demolition
28. Excavation And Backfill
29. Concrete Work
30. Cutting And Patching
31. Lintels
32. Building Access
33. Equipment Access
34. Lubrication
35. Housekeeping And Clean Up
36. Sheeting, Shoring And Bracing
37. Dewatering
38. Rock Excavation
39. Surface Restoration

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. This section applies to all Division 22 sections of plumbing.

1.04 SUBMITTALS

- A. Submit shop drawings for equipment under each section per requirements listed in that section, as well as per Division 1.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Do not submit hard copies of web pages. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- C. On request from the A/E, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.
- D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- E. The submittals must be approved before fabrication is authorized.
- F. Provide electronic copies of all submittals for review. Electronic submittals shall be sent to wi@henneman.com for review.
- G. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the motor starter schedule is in agreement or indicate any discrepancies.
- H. Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following plumbing system data sheet. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and

equipment with manufacturer and model number. The approved plumbing system data sheet(s) will be made available to the owner's project representative for their use on this project.

Plumbing System Data Sheet:

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves			
Pipe Specialties			
Hangers & Supports			
Insulation			
Plumbing Specialties			
Plumbing Fixtures			
Plumbing Equipment			

- I. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.
- J. Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:
 1. Operating and Maintenance Manuals 2 copies
 2. Owner 1 copy
 3. Architect/Engineer 2 copies

1.05 REFERENCE STANDARDS

- A. Abbreviations of standards organizations referenced in this and other sections are as follows:
 1. ABMA American Boiler Manufacturers Association
 2. ACPA American Concrete Pipe Association
 3. AGA American Gas Association
 4. ANSI American National Standards Institute
 5. AHRI Air Conditioning, Heating and Refrigeration Institute
 6. ASME American Society of Mechanical Engineers
 7. ASPE American Society of Plumbing Engineers
 8. ASSE American Society of Sanitary Engineering
 9. ASTM American Society for Testing and Materials
 10. AWWA American Water Works Association
 11. AWS American Welding Society
 12. CISPI Cast Iron Soil Pipe Institute
 13. CGA Compressed Gas Association
 14. CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
 15. EPA Environmental Protection Agency
 16. FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
 17. GAMA Gas Appliance Manufacturers Association
 18. IAPMO International Association of Plumbing & Mechanical Officials
 19. IEEE Institute of Electrical and Electronics Engineers
 20. ISA Instrument Society of America
 21. MICA Midwest Insulation Contractors Association
 22. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
 23. NBS National Bureau of Standards
 24. NEC National Electric Code
 25. NEMA National Electrical Manufacturers Association
 26. NFPA National Fire Protection Association
 27. NSF National Sanitation Foundation
 28. PDI Plumbing and Drainage Institute

29. STI Steel Tank Institute
30. UL Underwriters Laboratories Inc.
- A. Standards referenced in this section:
 1. ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete
 2. ASTM D1557 Standard Test Method for Moisture-Density Relations of Soils
 3. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
 4. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
 5. UL1479 Fire Tests of Through-Penetration Firestops
 6. UL723 Surface Burning Characteristics of Building Materials

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1 for equals and substitutions.
 1. Where the following conflicts with Division 1, the requirements of Division 1 shall govern.
 2. If the Contractor wishes to submit an alternate to the named manufacturers for any equipment, he may submit a voluntary alternative minimum 7 days prior to bid, stating the manufacturer's name, model number, written, detailed product data.
 3. Where materials or equipment are specified by name the proposed material or equipment must be identical to the specified material or equipment in all characteristics of quality, function and serviceability, regardless of application in the Project and, in addition, when the Architect deems that aesthetic significance is important, the equal material or equipment must be identical in all characteristics of visual appearance, design, color and texture. Any proposed equal shall be submitted to Architect/Engineer for prior approval, which Architect/Engineer may approve or disapprove in its sole discretion. Work performed or constructed with unapproved equals is at Contractor's risk and any required correction of work incorporating unapproved equals shall be at Contractor's sole cost and expense.
 4. In all instances, Contractor shall assume full responsibility for proof of equality of the statute to the equipment hereinafter specified. All data and information necessary for proof of equality, function and space requirements shall be prepared and accompany the submittal of the substitution to the Architect/Engineer. Approval by the Architect/Engineer of equipment other than the specified does NOT relieve Contractor of this responsibility.
- B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.
- C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system, including, but not limited to, coordination with other trades and any required changes by other trades and for obtaining the intended performance from the system into which these items are placed.

1.07 LEAD FREE REQUIREMENTS

- A. All materials that contact potable water shall be lead free. Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content $\leq 0.25\%$ per the Federal Safe Drinking Water Act as amended January 4th 2011 Section 1417.
- B. This requirement applies to all of the subsequent Plumbing Specification Sections and Plumbing Drawings and supersedes any part or model number that may conflict with this requirement.

1.08 GUARANTEE

- A. Refer to Division 1 for guarantees and warranties. In addition to the requirements in Division 1, this Contractor shall meet the following requirements.
- B. In entering into a contract covering this work, the contractor accepts the specifications and guarantees that the work will be carried out in accordance with the requirements of this specification or such modifications as may be made under the contract documents.
- C. Contractor further guarantees that the workmanship and material will be of the best procurable and that none but experienced workmen familiar with each particular class of work will be employed.
- D. Contractor further guarantees to replace and make good at his own expense, including travel time, all defects, which may develop within 1 year after final payment and acceptance by the

Architect/Engineer, due to faulty workmanship or material, upon, receipt of written notification from the Owner.

1.09 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 1 for all operations and maintenance instructions.
- B. In addition to the general content specified under Division 1 supply the following additional documentation:
 - 1. Copies of all approved submittals along with approval letters
 - 2. Records of tests performed a to certify compliance with system requirements
 - 3. Manufacturer's wiring diagrams for electrically powered equipment
 - 4. Certificates of inspection by regulatory agencies
 - 5. Valve schedules
 - 6. Lubrication instructions, including list/frequency of lubrication
 - 7. Parts lists for fixtures, equipment, valves and specialties
 - 8. Manufacturers' installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties
 - 9. Additional information as indicated in the technical specification sections

1.10 RECORD DOCUMENTS

- A. Refer to Division 1 for record documents.
- B. In addition to the general content specified under Division, follow the following procedures.
 - 1. During the progress of the work, Contractor shall maintain a current (daily) record set of the drawings and specifications, indicating thereon all work installed at variance with such Contract Documents including, without limitation, work covered by Addenda, Field Work Orders, Change Orders and Engineers additional instructions, interpretations and clarification. All changes or deviations from the original layout of the work and all critical dimensions of buried or concealed work shall be recorded. It shall be Contractor's responsibility to assure that said record sets are complete, accurate and up-to-date, Engineer shall have the right to inspect and review such record sets.
 - 2. At the completion of the work, Contractor shall indicate on record sets all record changes and such additional details necessary or appropriate to provide a complete reference document for use by Engineer. If variations and details cannot be shown clearly thereon, the Contractor shall prepare supplemental drawings adequate to impart the information. The foregoing drawings collectively shall constitute the "Record" drawings for the work.
 - 3. All indication on "Record" drawings shall be executed in a legible manner at Contractor's cost, using methods and legend presentations compatible with the overall scheme of the record drawings with respect to scale, drawing sheet sizes and sequential indexing. All changes shall be marked clearly in red and clouded.
 - 4. Engineer may review Contractor's "Record" drawings and notify Contractor of observed discrepancies or deviations. Contractor shall promptly correct discrepancies, deviations or illegible markups at Contractor's expense and resubmit revised drawings for Engineer review.
 - 5. Engineer will provide final electronic record drawings to the Owner based on Contractor's markups.

1.11 CONTINUITY OF EXISTING SERVICES

- A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.
- B. Each Contractor shall be thoroughly familiar with existing systems which will affect and be affected by relocation of existing equipment and installation of new lines and equipment. Contractor shall plan installation of their work so that interruptions of services to any building or portion thereof will be a minimum and such interruptions shall occur only when system is not required, if possible. If not possible, each Contractor shall insure the operation of services by whatever means possible, such as, installing bypasses, capping of services or providing temporary service. Each interruption shall be for as short a duration as possible.

- C. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- D. This Contractor shall restore any circuit interruption as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven day week schedule.

1.12 PROTECTION OF FINISHED SURFACES

- A. Refer to Division 1.

1.13 SEALING AND FIRESTOPPING

- A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.
- B. Contractor shall request current life safety drawings from Architect/Owner.

1.14 OFF SITE STORAGE

- A. If payment will be requested for approved offsite stored material, then the Contractor shall complete an "Offsite Storage Agreement" which is available from the Owner. Prior approval by Owner's personnel for offsite storage will be needed. No material will be accepted for offsite storage unless submittals for the material have been approved.

1.15 REGULATORY REQUIREMENTS

- A. Comply with requirements of Wisconsin Administrative Code and local Authority Having Jurisdiction (AHJ) regarding materials and installation.

1.16 CERTIFICATES AND INSPECTIONS

- A. Refer to Division 1 for permits, regulations, utilities and taxes.
- B. Obtain and pay for all required local or State installation inspections except those provided by the Architect/Engineer in accordance with State code. Deliver originals of these certificates to the Owner. Include copies of the certificates in the Operating and Maintenance Instructions.
- C. Coordinate and provide inspections as required by the Authority Having Jurisdiction over the site.

1.17 COORDINATION

- A. Refer to Division 1 for coordination. In addition to the requirements specified under Division 1, the following requirements apply.
- B. It shall be the responsibility of each Contractor to coordinate and consult with each other to determine space requirements and to determine that adequate space for servicing is provided for all equipment whether furnished by the Contractor or others. The General Contractor shall have final decision on all space priority conflicts among Contractors. All space priority conflicts shall be brought to the attention of the Architect/Engineer and Owner's Representative.
- C. Each Contractor shall be thoroughly familiar with existing systems which will affect and be affected by relocation of existing equipment and installation of new lines and equipment. They shall plan installation of their work so that interruptions of services to any building or portion thereof will be a minimum, and such interruptions shall occur only when system is not required, if possible. If not possible, each Contractor shall insure the operation of services by whatever means possible, such as, installing bypasses, capping of services, or providing temporary service. Each interruption shall be for as short a duration as possible.
- D. Cooperation among all Contractors shall be required. Any Work that is installed without cooperating or coordinating with other Contractors and is in conflict shall be removed and reinstalled at that particular Contractor's cost. No cost additions to the Project will be considered due to a Contractor's lack of participation in the cooperation and coordination process. The following list of items of Work shall be the priority of order for all Contractors:
 - 1. Structure
 - 2. Recessed light fixtures
 - 3. Gravity-flow systems for sanitary, storm, steam and steam condensate piping
 - 4. Ductwork and appurtenances

5. Electrical and low voltage cable tray
 6. Plumbing vent piping
 7. Fire protection (sprinkler system)
 8. HVAC piping
 9. Medical gas piping
 10. Gas piping, process piping and domestic water
 11. Electrical conduit and low voltage conduit
 12. Control air lines or conduit
- E. The above list, in descending order, is the precedence assigned the Work items for space priority. Gravity-flow systems have first priority.
- F. Exception: Plumbing lines below or behind plumbing fixtures shall have precedence over all other work. Electrical conduit above or below switchgear, panelboards and control panels shall have precedence over all other work. Do not install any fluid conveying piping over electrical or elevator equipment.
- G. In the case of interconnection of the work of two or more contractors, verify at the site or on shop drawings all dimensions relating to such work. All errors due to the failure to so verify any such dimensions shall be promptly rectified.
- H. Any installed work that is not coordinated and interferes with another contractor's work shall be removed or relocated at the installing contractor's expense.
- I. Prior to start of Construction, the General Contractor shall schedule a meeting with all of the Contractors responsible for the work items listed above. The purpose of the meeting is to introduce the coordination program and to determine its implementation in relation to the progress schedule.
- J. At the initial Coordination Meeting, the Mechanical Contractor / Ventilating Contractor shall provide to the General Contractor outline drawings at 1/4" scale indicating column centerlines, interior partition locations, and ceiling heights. The General Contractor shall verify all information shown on these drawings and relay any changes in the information to the Ventilation Contractor to be reflected on the Drawings. The Ventilating Contractor, with reference and consideration to the Structural, Heating, Electrical, Fire Protection, and Plumbing Drawings, shall draw to scale his proposed installation showing duct sizes, equipment layouts, and dimensions from column lines and from finished floors to bottom of ducts. Ductwork shall be maintained as tightly as possible to the underside of floor slabs and/or beams. For congested areas the Ventilating Contractor shall, in addition, prepare Drawings in section view. During this phase of the program, it shall be the Electrical Contractor's responsibility to furnish the Ventilating Contractor with recessed lighting installation and clearance requirements. This information shall be outlined on the Drawings by the Ventilating Contractor.
- K. The ductwork layouts shall be produced in sequence as mandated by the Project Schedule. The earliest area indicated in the Schedule shall receive the first effort, etc.
- L. When the Ductwork Drawings for the earliest scheduled area have been completed (time limitation as determined at the initial coordination meeting), the Ventilating Contractor shall provide the General Contractor with one set of drawings for each participant in the effort. The General Contractor will distribute the drawings to the participating Contractors for their use in drawing thereon the major components of their proposed installation using the general scheme shown on the Contract Drawings as a guide.
- M. The major components to be indicated include (but are not limited to) the following:
1. Structure
 2. Roof drain leaders
 3. Above 3" waste piping
 4. Sprinkler mains
 5. Heating hot water mains
 6. Chilled water mains
 7. Conveying systems
 8. Significant conduit runs
 9. Cable trays
 10. Contract ceiling heights
 11. Soffits
 12. Access points
 13. Fire wall penetrations

- 14. Steam and condensate mains
- 15. Gas, water, and process piping
- N. Information delineated shall be distance from column centerlines, pipe/equipment size, and distance from finished floor to bottom of pipe/equipment and hangers. Included on the Drawings shall be piping layout with hanger locations and hanger point loads. This information shall be developed satisfactorily enough to allow the Structural Engineer to verify the adequacy of the structural system for the projected loads. The hanger locations may have to be moved depending on the structural system review. No hanger shall be fabricated and/or installed until the hanger locations are reviewed and accepted by the Architect/Engineer.
- O. Within a period not to exceed two weeks after distribution of the drawings, the General Contractor will schedule a meeting with the Architect/Engineer and participating Contractors at which time areas of conflict shall be resolved. The drawings shall be overlaid to identify areas of conflict. All parties shall then cooperate in resolving the conflicts. Records of the agreements shall be entered on the Ventilating Contractor's drawings, acknowledged by all participants by signature in space provided for this purpose, and two copies distributed to all involved parties. All coordination drawing preparation and reproduction costs shall be borne by the Ventilating Contractor. The above drawings, review, and coordination process shall be repeated until all areas on the Project have been coordinated.
- P. In the event a Contractor fails to cooperate in the Coordination Program, they shall be held responsible for all costs incurred for adjustments to the work of others made necessary to accommodate the uncooperative Contractor's installations.

1.18 DEMOLITION AND EXISTING REQUIREMENTS

- A. Existing active services: water, gas, medical gas, steam, ventilation, compressed or control air, sanitary waste, sanitary vent, storm electric, and any other building systems when encountered shall be protected against damage. Where existing services are to be abandoned, the services shall be removed back to the point of origin and removed from the site unless otherwise directed by the Owner's Representative.
- B. Submit a "Sequence of Work Schedule" in respect to all temporary and permanent utility and service cutovers after final determination. This schedule shall be submitted for approval to the Owner and Architect/Engineer. The submittal shall designate priority order, service or utility affected, date of cutover, and time of day to start and finish.
- C. Bidders should inspect the site to become familiar with conditions of the site which will affect the Work. Bidders should verify points of connection with utilities, routing of outside piping to include required clearances from any existing structures, or other obstacles.
- D. Extra payment will not be allowed for changes in the Work required because of the successful bidder's failure to make this inspection.

1.19 REQUEST AND CERTIFICATION FOR PAYMENT

- A. Within 10 days after Notice to Proceed, the successful bidder will submit to the Owner's Project Representative in a form prescribed by Division 1, a cost breakdown of the proposed values for work performed which, if approved by the owner, will become the basis for construction progress and monthly payments. The cost breakdown items shall reflect actual work progress stages as closely as feasible.
- B. In addition, if payment is requested for approved off-site stored material, then that material shall be listed as a line item in the request and certification for payment cost breakdown.

1.20 SLEEVES AND OPENINGS

- A. Openings required in new or existing construction that may be necessary for the installation of new work shall be provided by the respective contractor and all patching and repairing shall be done by workmen competent in the trade required, at the expense of the respective contractor. The respective contractor shall be responsible for arranging the work so that minimum cutting will be required. All rubbish and excess materials involved in such cutting shall be promptly removed from the site and disposed of by the contractor. Cutting through the floor or roof systems or load bearing walls shall be done only with the prior written approval of the Architect/Engineer so as to avoid damaging the structural system.

1.21 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the A/E to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.22 DEFINITIONS

- A. Wherever the words “the Contractor”, “this Contractor” or “Plumbing Contractor” appear in this division, they refer to the Contractor for Plumbing work.
- B. The term “provide” includes such labor, methods, materials, equipment and transportation or other facilities required to complete the Contract and the performance of all duties thereby upon the Contractor.

1.23 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of A/E before proceeding.
- C. Tools, materials and equipment shall be confined to areas designated by the Owner’s project representative.

1.24 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate Owner's occupancy requirements. During the construction period coordinate schedule and operations with Owner's Construction Representatives.

1.25 SALVAGE MATERIALS

- A. No materials removed from this project shall be reused (except as specifically noted below). All materials removed shall become the property of and shall be disposed of by the Contractor.

1.26 TRAINING

- A. The contractor shall have the following responsibilities:
 - 1. Provide a training plan sixty days before the planned training covering the following elements:
 - a. Equipment
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, manufacturer’s quality video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - 2. Provide designated owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
 - 3. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 - 6. The controls contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 - 7. The training sessions shall follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 8. Training shall include:

- a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
 - c. Discussion of relevant health and safety issues and concerns.
 - d. Discussion of warranties and guarantees.
 - e. Common troubleshooting problems and solutions.
 - f. Explanatory information included in the O&M manuals.
 - g. Discussion of any peculiarities of equipment installation or operation.
 - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
 - i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.
9. The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
- B. Video recording of the training sessions will be provided by the contractor and added to the O&M manuals. In addition, factory training videos identifying key troubleshooting, repair, service and/or replacement techniques shall be provided and reviewed with the owner.
- C. Provide a minimum of 16 hours of instruction.
- D. Provide additional training as specified in other specification sections for specific equipment.

PART 2 – PRODUCTS

2.01 ACCESS PANELS AND DOORS

- A. Lay-in Ceilings:
 - 1. Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Division 9 are sufficient; no additional access provisions are required unless specifically indicated.
- B. Plaster Walls and Ceilings:
 - 2. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

2.02 IDENTIFICATION

- A. Manufacturers: EMED Company, W.H. Brady, Seton Nameplate Company, Thor Enterprises, Carlton, MSI Marking Services.
- B. Engraved Name Plates:
 - 1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting.
- C. Snap-Around Pipe Markers:
 - 1. One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, 3/4" min. size for lettering. Provide nylon ties on each end of pipe markers.
- D. Valve Tags:
 - 1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem.
 - 2. Round self-adhesive paper circles (dots), color coded blue for cold water system valves and red for hot water system valves, with nominal 5/8" diameter. For concealed valves located above ceiling tile, installed on T-grid.

- E. Underground Warning Tape:
 1. Detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape.
 2. Underground Tracer Wire:
 3. All underground non-metallic sewers/mains and water services/mains shall be provided with tracer wire installations. Tracer wire shall be continuous solid copper or steel plastic coated with split bolt or compression-type connectors.

2.03 BEDDING AND BACKFILL

- A. Bedding up to a point 12" inches above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand		Gradation for Crushed Stone Chip Bedding	
Sieve Size	% Passing (by Wt.)	Sieve Size	% Passing (by Wt.)
1 inch	100	1/2 inch	100
No. 16	45 - 80	No. 4	75 - 100
No. 200	2 - 10	No. 100	10 - 25

- B. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.
- C. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable and frozen materials.

2.04 SLEEVES AND OPENINGS

- A. General:
 1. Pipe sleeves shall be constructed of standard weight ASTM A53 or ASME B36.10 steel with an anchor plate constructed of A36/A36M steel welded to the pipe. The sleeve shall be sized a minimum of 1" larger than piping insulation diameter. The entire assembly shall be hot-dip galvanized after fabrication.
 2. Duct sleeves and piping sleeves passing through interior walls shall be constructed of 24 gauge galvanized steel minimum thickness.
- B. Sleeves Through Below Grade Walls:
 1. Provide steel pipe sleeve, ASTM A53, pressure sealing with membrane clamp ring, gasket, water stop ring, external rings, and nitrile rubber link seals. The assembly shall be hot-dip galvanized after fabrication.
 - a. Seals: Modular mechanical type seals, consisting of interlocking nitrile rubber links shaped to continuously fill the annular space between the pipe and the sleeve and electrically isolate the carrier pipe from the steel sleeve.
 - b. Sealing Element: Polychloroprene rubber material compounded to resist aging, ozone, sunlight, hydrocarbon gases, water, and chemical action.
 - c. Hardware: Type 300 series stainless steel fasteners. Threads rolled to produce smooth uniform threads and unbroken flow lines.
 - d. Compression Plates: Fiberglass-reinforced polyester plastic, injection molded for high physical properties, dielectric strength and non-cold flow creep characteristics, having high resistance to acidic and alkaline soils.
 2. For sleeves located 15 feet or more below grade provide cast iron sleeve ASTM A74 with compression seals.

2.05 SEALING AND FIRESTOPPING

- A. Fire and/or Smoke Rated Penetrations:
 1. Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco.
 2. All firestopping systems shall be provided by the same manufacturer.
 3. Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Owner and the Authority Having Jurisdiction (AHJ).
 4. Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets,

- installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon.
5. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.
 6. Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.
 7. All sealants shall meet the intent of LEED® VOC requirements, <250 g/L VOC contents (less H₂O and exempt solvents).
- B. Non-Rated Penetrations:
8. Pipe Penetrations Through Below Grade Walls: In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be accessible from the interior of the building.
 9. Pipe Penetrations: At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

PART 3 – EXECUTION

3.01 DEMOLITION

- A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.
- B. All pipe, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the owner for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.
- C. All contractors requiring the personnel/ material hoist and or temporary construction elevator (i.e. new elevators, temporarily protected) at times other than outlined in the temporary facilities specifications will make arrangements directly with the general contractor. The general contractor is responsible for all coordination and scheduling of the use of any hoisting equipment so the flow of the project is smoothly maintained and all workers have access to the work areas to perform their work and deliver material to the areas needed according to the project schedule.
- D. If any contractor's work requires the removal and replacement of any finished materials including but not limited to such materials as ceiling tiles, wall finishes, cabinets, doors, flooring, windows, etc. after those items are installed, each contractor will be responsible, at no additional cost to the owner, to replace any damaged, soiled or lost materials with new materials to match the existing materials and those materials damaged.

3.02 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface.
- B. Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed

- by the work and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.
- C. Strip topsoil from area to be excavated, free from subsoil and debris, and store for later respreading.
 - D. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.
 - E. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.
 - F. Remove surplus excavated materials from site.
 - G. Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap.
 - H. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.
 - I. Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.
 - J. Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure there is no disturbance of bearing soil.
 - K. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.
 - L. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.03 CONCRETE WORK

- A. Cast-in-place concrete within the building will be performed by the Division 3 Contractor unless otherwise noted. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support or installation of plumbing piping, fixtures, specialties and equipment. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with the Division 3 Contractor.
- B. Plumbing related cast-in-place concrete on the exterior of the building to be provided by this Contractor in conformance with requirements of Division 3. This includes piping thrust restraints, pipe supports, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc.

3.04 CUTTING AND PATCHING

- A. Refer to Division 1 for cutting and patching. In addition to the requirements in Division 1:
- B. Each Contractor shall coordinate the placing of openings in the new structure as required for the installation of each Contractor's work.
- C. Each Contractor shall furnish to the General Contractor the accurate locations and sizes for required openings in the new work, but this shall not relieve each Contractor of the responsibility of checking to assure that properly sized openings are provided. When additional patching is required due to the Contractor's failure to inspect this work, then the Contractor shall make arrangements for the patching required to properly close the openings to include patch painting, and the Contractor shall pay any additional cost incurred in this respect.
- D. If cutting and patching of the new structure is made necessary due to the Contractor's failure to install piping, ducts, sleeves, or equipment on schedule, or due to the Contractor's failure to furnish on schedule the information required for the leaving of openings, then it shall be the Contractor's responsibility to make arrangements and obtain approval from the General Contractor and Architect/Engineer for this cutting and patching, and the Contractor shall pay any additional cost

incurred in this respect. The Contractor shall also reimburse the Owner for any additional costs incurred to the Architect/Engineer for additional services caused by the Contractor in this respect.

- E. The Contractor shall provide cutting and patching and patch painting in the existing structure as required for the installation of his Work and shall furnish lintels and supports as required for openings. Cutting of structural support members will not be permitted without prior approval of the Architect/Engineer. Extent of cutting shall be minimized; use core drills, power saws, or other machines which will provide neat, minimum openings. Patching shall match adjacent materials and surfaces and shall be performed by craftsmen skilled in the respective craft required.

3.05 LINTELS

- A. All steel lintels required for opening in existing and/or new masonry walls shall be provided under section 05 50 00 – Metal Fabrications. (This contractor shall design, fabricate, and install all lintels required in masonry walls for duct and pipe penetrations. Contractor shall submit design drawings of lintels with professional engineers seal and signature prior to installation.

3.06 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.07 EQUIPMENT ACCESS

- A. Install all piping, conduit and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Plumbing Contractor and installed by the General Contractor.
- B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

3.08 COORDINATION

- A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.09 IDENTIFICATION

- A. Identify interior piping not less than once every 10 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location.
- B. Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.
- C. Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.
- D. Identify valves concealed above ceiling tile with self-adhesive colored circles (dots), adhered to nearest ceiling tile T-grid, visible from floor. Blue dots for cold water systems valves, and red dots for hot water systems valves.

3.10 LUBRICATION

- A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the Owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.11 SLEEVES AND OPENINGS

- A. General:
 - 1. Sleeves are not required for piping and ducts passing through interior non-rated drywall, plaster, or wood partitions and interior poured concrete walls that have been saw cut or core drilled.
 - 2. Pack annular space between sleeves and pipe or ducts with fiberglass insulation and seal.
 - 3. Piping sleeves that pass through fire rated floors, walls, or ceilings shall be provided with a UL listed fire stop material meeting UL 1479 to seal the opening between the pipe and the pipe sleeve to maintain the fire rating.
 - 4. Provide escutcheon plates on piping to cover sleeve and insulation in finished areas.
 - 5. Refer to Division 1, General Requirements for additional information on sleeves and openings.
- B. Sleeves Through Floors/Ceilings:
 - 1. Sleeves shall be installed to extend 1 inch above finished floor with a watertight sealant between floor and sleeve in all mechanical rooms and wet rooms listed below.
 - 2. If a sleeve is not provided, provide 1-1/2 inch angle ring with urethane caulk between the angle and the floor and seal at the corners to form a watertight seal.
 - a. Wet Locations: Edit list for each project
 - 1) Mechanical Rooms

3.12 SEALING AND FIRESTOPPING

- A. The Contractor shall refer to building life safety drawings for all smoke and fire rates in addition to the mechanical drawings. Any discrepancies shall be brought to the attention of the Architect/Engineer before final addendum.
- B. Fire And/Or Smoke Rated Penetrations:
 - 1. Install approved product in accordance with the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.
 - 2. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.
- C. Non-Rated Partitions:
 - 3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.
 - 4. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

3.13 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.14 SHEETING, SHORING AND BRACING

- A. Provide shoring, sheet piling and bracing in conformance with the Building Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the engineer, maintained in place until other permanent support approved by the engineer is provided.

3.15 DEWATERING

- A. Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

3.16 ROCK EXCAVATION

- A. Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume.
- B. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

3.17 SURFACE RESTORATION

- A. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.
- B. Lawns: Topsoil with 4" of clean, friable, fertile topsoil, free from debris, lumps, rocks, roots, plants and seeds. Grade surfaces to match adjacent elevations. Rake smooth, free of lumps and debris. Sod with good quality nursery sod, uniform, dense, free from weeds and consisting of approximately 60% Kentucky blue grass and the balance perennial rye, fescue and white clover. Place sod with joints staggered and abutting. Maintain lawn areas for one month after installation. Contractor will be responsible for necessary watering and mowing. Do necessary weeding, repair, reseeding or resodding until uniform catch is obtained.
- C. Curb and Gutter: Concrete curb and gutter conforming to local requirements.
- D. Sidewalk and Walkways: Non-reinforced concrete conforming to local requirements, thickness to match existing, cross slope of one-fourth inch per foot, scored into squares approximately equal to width.
- E. Bituminous Concrete Pavements: 4" thick crushed stone base course and two pass bituminous concrete pavement, first course 1-1/2" binder, second course 1-1/2" surface.

END OF SECTION

**SECTION 22 05 14
PLUMBING SPECIALTIES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for floor drains, roof drains, cleanouts, backflow preventers, water hammer arrestors and other miscellaneous plumbing specialties.
 - 1. Floor Drains
 - 2. Trench Drains
 - 3. Cleanouts
 - 4. Water Hammer Arrestors
 - 5. Backflow Preventers
 - 6. Wall Hydrants
 - 7. Hose Bibbs
 - 8. Trap Guards
 - 9. Safings
 - 10. Vent Flashings

1.03 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 22 05 23 – General-Duty Valves for Plumbing Piping
- C. Section 22 11 00 – Facility Water Distribution
- D. Section 22 13 00 – Facility Sanitary Sewerage

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Floor Drains
 - 2. Trench Drains
 - 3. Cleanouts
 - 4. Water Hammer Arrestors
 - 5. Backflow Preventers
 - 6. Wall Hydrants
 - 7. Hose Bibbs
 - 8. Trap Guards
 - 9. Safings
 - 10. Vent Flashings
- B. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 REFERENCE STANDARDS

- A. ANSI A112.21.1 - Floor Drains.
- B. ANSI A112.26.1/PDI WH-201 - Water Hammer Arrestors.
- C. ASSE 1001 - Pipe Applied Atmospheric Type Vacuum Breakers.
- D. ASSE 1010 - Water Hammer Arrestors.
- E. ASSE 1011 - Hose Connection Vacuum Breakers.
- F. ASSE 1012 - Backflow Preventers with Intermediate Atmospheric Vent.
- G. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

- H. ASSE 1017 - Temperature Activated Mixing Valves For Hot Water Distribution Systems.
- I. ASSE 1018 - Trap Seal Primer Valves.
- J. ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type.
- K. ASSE 1021 - Drain Air Gaps for Domestic Dishwasher Applications.
- L. ASSE 1072 - Barrier Type Floor Drain Trap Seal Protection.

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Plumbing products requiring approval by the State of Wisconsin Dept. of Safety & Professional Services must be approved or have pending approval at the time of shop drawing submission.

1.07 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 22 05 00 – Common Work Results for Plumbing.

PART 2 – PRODUCTS

2.01 FLOOR DRAINS

- A. Manufacturer: Josam, Smith, Wade, Watts, Zurn
- B. Refer to plumbing fixture schedules on drawings for specific selections regarding basis of design.

2.02 TRENCH DRAINS

- A. Manufacturer: Aco, Josam, Neenah, Smith, Tyler, Watts, Zurn
- B. Refer to plumbing fixture schedules on drawings for specific selections regarding basis of design.

2.03 CLEANOUTS

- A. Manufacturer: Josam, Smith, Wade, Watts, Zurn
- B. Interior Concrete Floor Areas: Enameled cast iron body with round or square adjustable scoriated polished nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400- / ZN-1400-T.
- C. Interior Ceramic Tile Floor Areas: Enameled cast iron body with square adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400-T.
- D. Interior Vinyl Tile Floor Areas: Enameled cast iron body with round adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400.
- E. Interior Carpeted Floor Areas: Enameled cast iron body with round adjustable scoriated nickel bronze cover and secured carpet marker, tapered threaded ABS closure plug. Zurn Z-1400-CM.
- F. Interior Finished Wall Areas: Line type cleanout tee with tapered threaded ABS cleanout plug, round polished stainless steel access cover secured with machine screw. Screw shall not pass completely through ABS plug, trim screw as necessary. Zurn Z-1446.
- G. Interior Exposed Vertical Stacks: Line type cleanout tee with tapered threaded ABS closure plug. Zurn Z-1445.
- H. Interior Horizontal Lines: Cast iron hub with tapped ferrule and tapered threaded ABS or PVC closure plug, or no-hub coupling and blind plug.
- I. Exterior (Yard): Schedule 40 PVC frost sleeve and access cover, sized to fit over a 6” diameter cleanout riser, 48” long. Stamp access cover with “SAN” or “ST” legend. Plumbing Creations PVC-48-8.

2.04 WATER HAMMER ARRESTORS

- A. Manufacturer: PPP Industries, Sioux Chief, Wade, Watts
- B. ANSI A112.26.1M, ASSE 1010; sized in accordance with PDI WH-201, precharged piston type constructed of hard drawn copper, threaded brass adapter, brass piston with o-ring seals, FDA approved lubricant, suitable for operation in temperature range 35 to 180 degrees F, maximum 150 psig working pressure. Watts LF15.

2.05 BACKFLOW PREVENTERS

- A. Manufacturers: Cash-Acme, Cla-Val, Conbraco, Febco, Watts, Wilkins
- B. Hose Connection Vacuum Breakers: ASSE 1011, brass or bronze construction, EPDM diaphragm and seat, rated for 125 psig and 180°F. Watts 8 (interior application).
- C. Pipe Applied Atmospheric Type Vacuum Breakers: ASSE 1001, same size as pipe, brass or bronze construction, silicone disc, rated for 125 psig and 160°F. Watts 288A.

2.06 WALL HYDRANTS

- A. Manufacturer: Chicago Faucet, Josam, J.R. Smith, Mifab, Wade, Watts, Woodford, Zurn
- B. Refer to plumbing fixture schedules on drawings for specific selections regarding basis of design.

2.07 HOSE BIBBS

- A. Manufacturer: Chicago Faucet, Josam, J.R. Smith, Mifab, Wade, Watts, Woodford, Zurn
- B. Refer to plumbing fixture schedules on drawings for specific selections regarding basis of design.

2.08 TRAP GUARDS

- A. Manufacturers: ProSet Systems Trap Guard, Rectorseal SureSeal, PPP Pro-Drain, Mifab
- B. Barrier type, flexible elastomeric PVC construction diaphragm trap guard for installation in new and existing floor drains, hub drains, and trench drains, ASSE 1072. Trap guard to prevent trap evaporation and waste backflow. Size as applicable to the drain outlet size.

2.09 SAFINGS

- A. Manufacturers: Noble, DalSeal, Oatey
- B. Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, joined with CPE solvent.
- C. 3 lb. / square foot sheet lead.

2.10 VENT FLASHINGS

- A. Manufacturers: Semco, Oatey
- B. Formed 3 lb. /sq. ft. lead flashing with minimum base size of 15"x17".
- C. Single Ply Membrane Roofs: Flashing boot of material compatible with roofing membrane with base flange for adhering to membrane and two stainless steel adjustable drawbands for securing to vent pipe.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance with manufacturers recommendations.
- B. Set floor drains level and plumb adjusted to finished floor elevation. Locate where serviceable.
- C. Set trench drains level and plumb adjusted to finished floor elevation. Locate where serviceable.
- D. Set cleanouts level and plumb adjusted to finished floor elevation or finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for rodding. Lubricate threaded cleanout plugs with graphite and oil, Teflon tape or waterproof grease.
- E. Install trap guards and/or trap primer connections where indicated.
- F. Provide deep seal traps on floor drains and hub drains installed in mechanical rooms, penthouses or rooms with excessive positive or negative pressure.
- G. Floor drains and hub drains installed in public restrooms, locker rooms, seldom used rooms, and areas with minute drainage flow shall have installations of trap guards or trap primers.
- H. Install water hammer arrestors where indicated and at quick closing valve installations.
- I. Install backflow preventers in accordance with Wisconsin Department of Safety & Professional Services requirements maintaining minimum clearance distances for servicing and testing. Provide indirect waste piping with air gap installation from relief opening to above hub drain or floor drain.
- J. Install lab faucet vacuum breakers with Loctite 242 "blue" on threads.

- K. Where backflow preventers requiring Department of Safety & Professional Services registration are installed, obtain Regulated Object ID Number from DSPPS, and provide initial testing and report filing required by Department of Safety & Professional Services.
- L. Mount wall hydrants in exterior wall construction with valve extended beyond interior side of building insulation. Slope to drain to building exterior. Install 24" minimum above finished grade. Set wall hydrant in grout or caulk and fill exterior wall penetration with insulation.
- M. Install safing at floor drains above grade. Extend 12" beyond drains in all directions. Cover entire floor in showers and extend 6" up in walls above curbs and to a height of 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test. Install safing at all built-up shower installations. Spray-on and brush-applied liquid safing is not acceptable.
- N. Flash vent penetrations through roof. Turn down top of lead flashing into vent pipe. Tighten drawband of membrane boot to vent pipe. Adhere base flashing to deck or membrane. Provide waterproof patch around penetration on existing roofs.

END OF SECTION

**SECTION 22 05 15
PIPING SPECIALTIES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section contains specifications for plumbing piping specialties for all piping systems.
 - 1. Thermometers
 - 2. Thermometer Sockets
 - 3. Test Wells
 - 4. Test Plugs
 - 5. Pressure Gauges
 - 6. Strainers

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 22 05 23 – General-Duty Valves for Plumbing Piping
- C. Section 22 07 00 – Plumbing Insulation
- D. Section 22 11 00 – Facility Water Distribution
- E. Section 22 30 00 – Plumbing Equipment

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Thermometers
 - 2. Thermometer Sockets
 - 3. Test Wells
 - 4. Test Plugs
 - 5. Pressure Gauges
 - 6. Strainers
- B. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.05 REFERENCE STANDARDS

- A. ASTM B650 Electrodeposited Engineering Chromium Coatings on Ferrous Substrates

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Division 1.

1.07 DESIGN CRITERIA

- A. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

1.08 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 22 05 00 – Common Work Results for Plumbing.

PART 2 – PRODUCTS

2.01 THERMOMETERS

- A. Ashcroft, Marsh, Taylor, H. O. Trerice, Ametek/U. S. Gauge, Weiss, Wika, Weksler
- B. Stem Type: Cast aluminum case, nine inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	Hot Water
Scale Range, °F	30 - 180
Increment, °F	2

2.02 THERMOMETER SOCKETS

- A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

2.03 TEST WELLS

- A. Similar to thermometer sockets except with a brass cap that threads into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.04 TEST PLUGS

- A. Brass threaded pressure and temperature test plug with neoprene self-closing valve, valve retainer, brass threaded cap, rated for 150 psi and 0-200 degrees F.

2.05 PRESSURE GAUGES

- A. Ametek/U. S. Gauge, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Wika, Weksler
- B. Cast aluminum case of not less than 4.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

Service	Hot Water	Cold Water	Compressed Air
Scale Range, psig	0-100	0-100	0-200
Increment, psig	1	1	2
- C. Pressure Snubbers: Bronze construction, 300 psig working pressure, 1/4" size.
- D. Gauge Valves: Use ball valves as specified in Section 22 05 23 - General-Duty Valves for Plumbing Piping.

2.06 STRAINERS

- A. Armstrong, Illinois, Keckley, Metraflex, Mueller Steam, Sarco, Watts.
- B. 4" and smaller: Wye pattern lead free; cast bronze body, 20 mesh stainless steel screen; threaded screen retainer tapped for closure plug; sweat or threaded, rated at 300 psi at 210 deg F. Include drain valve for blowdown. Watts LF777S, LFS777S.
- C. 4" and larger: Y type; cast iron body, ASTM A126; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded or flanged ends; rated at not less than 150 psi WOG. Include drain valve for blowdown.

PART 3 – EXECUTION

3.01 THERMOMETERS

- A. Stem Type: Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

3.02 THERMOMETER SOCKETS

- A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.03 TEST WELLS

- A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.04 TEST PLUGS

- A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for short-term measurement of pressure or temperature.

3.05 PRESSURE GAUGES

- A. Install in locations where indicated on the drawings and/or details, with scale range appropriate to the system operating pressures.
- B. Pressure Snubbers: Install in gauge piping for all gauges used on water services.
- C. Gauge Valves: Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

3.06 STRAINERS

- A. Install all strainers where indicated allowing sufficient space for the screens to be removed. Install a drain valve for blowout in the tapped screen retainer.

END OF SECTION

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SECTION 22 05 23
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes valve specifications for all Plumbing systems except where indicated under Related Work.
 - 1. Water System Valves
 - a. Ball Valves
 - b. Butterfly Valves
 - c. Swing Check Valves
 - d. Drain Valves
 - e. Spring Loaded Check Valves
 - 2. Specialty Valves And Valve Accessories
 - a. Gauge Valves
 - b. Water Pressure Reducing Valves
 - c. Safety Relief Valves

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 22 05 14 – Plumbing Specialties
- C. Section 22 11 00 – Facility Water Distribution
- D. Section 22 13 00 – Facility Sanitary Sewerage
- E. Section 22 30 00 – Plumbing Equipment

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Water System Valves
 - a. Ball Valves
 - b. Butterfly Valves
 - c. Swing Check Valves
 - d. Drain Valves
 - e. Spring Loaded Check Valves
 - 2. Specialty Valves And Valve Accessories
 - a. Gauge Valves
 - b. Water Pressure Reducing Valves
 - c. Safety Relief Valves
- B. Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.05 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.

1.06 DESIGN CRITERIA

- A. ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- B. ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.

- C. Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Owner.
- D. Valves to be line size unless specifically noted otherwise.
- E. Valves installed in potable water lines to be NSF/ANSI 61 and NSF 372 lead free compliant.

1.07 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 22 05 00 – Common Work Results for Plumbing.

PART 2 - PRODUCTS

2.01 WATER SYSTEM VALVES

- A. Manufacturers: Apollo, Asco, Conbraco, Crane, Hammond, Jomar, Milwaukee Valve, Nibco, Stockham, Victaulic, Watts
- B. All water system valves to be rated at not less than 125 water working pressure at 240 degrees F unless noted otherwise.
- C. Ball Valves:
 - 1. 3" and smaller: Two piece bronze body; full port, sweat or threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Apollo 77CLF-A, Milwaukee UPBA400/450, Nibco TS-585-80-LF, Watts LFB-6080/6081-G2.
 - a. Press Fit: Only where specifically permitted elsewhere in these specifications, product is to meet above requirements. Nibco PC-585-80-LF.
- D. Butterfly Valves:
 - 1. 2-1/2" and larger: Cast or ductile iron body; stainless steel shaft; bronze, copper or Teflon bushings; EPDM resilient seat; EPDM seals; bronze, aluminum-bronze, EPDM encapsulated ductile iron or stainless steel disc. 200 psig WOG through 12", 150 psig WOG through 24". Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use tapped lug type valves with stud bolts or cap screws, or grooved end connection valves, permitting removal of downstream piping while using the valve for system shutoff. Provide 10 position locking lever handle actuators for valves 6" and smaller. Provide worm gear operators with external position indication for valves 8" and larger. Hammond 5200 or 6200 series, Milwaukee M or C series, Nibco LD2000/LC2860, Watts BF-03-M2.
 - 2. 2-1/2" and larger: Cast brass body with copper-tube dimensioned grooved ends, stainless steel shaft (offset from the disc centerline to provide complete 360-degree circumferential seating), Fluoroelastomer pressure responsive seat, and aluminum-bronze disc. Bubble-tight to 300 psig. Victaulic 608.
 - 3. 2" and larger: Stainless steel body with grooved ends, stainless steel shaft (offset from the disc centerline to provide complete 360-degree circumferential seating), Fluoroelastomer pressure responsive seat, and stainless-steel disc. Bubble-tight to 300 psig. Victaulic Series 861.
- E. Swing Check Valves:
 - 1. 3" and smaller: Bronze body, sweat or threaded ends, Y-pattern, renewable PTFE seat and disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Nibco TS-413-Y-LF
 - 2. 4" and larger: Cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, Class 125, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward. Nibco F918B
- F. Drain Valves:
 - 1. 3/4" ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads. Apollo 70LF-200-HC, Milwaukee UPBA-100H or UPBA-150H, Hammond UP8501H or UP8511H, or equal by Nibco or Watts
- G. Spring Loaded Check Valves:

1. 2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, PTFE seat unless only bronze available. Apollo 61LF, Nibco TS-480-Y-LF, Watts LF600, Zurn 40XL2
2. 2-1/2" and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. Nibco W910 or F910
3. 3/8" compression: Downstream of fixture stop valve, compression x compression, NSF/ANSI 372 low lead: Chicago 243.315.AB.1
4. 2" and larger: Spring assisted for vertical or horizontal installation, stainless steel body with grooved ends, stainless steel spring and disc, with Fluoroelastomer seat. Victaulic Series 816

2.02 SPECIALTY VALVES AND VALVE ACCESSORIES

- A. Gauge Valves: Use 1/4" ball valves. Needle valves and gauge cocks will not be accepted.
- B. Water Pressure Reducing Valves:
 1. Bronze body, diaphragm operated with an integral thermal expansion bypass valve, inlet union, stainless steel strainer, renewable monel or stainless steel seat and adjustable reduced pressure range, 300 psig at 160 degrees F. Pre-set for the scheduled pressure. Cash Acme, Watts, Apollo/Conbraco, Zurn/Wilkins, Victaulic/Bermad.
 2. Automatic control valve, pilot operated, ductile iron body, ANSI/NSF 61 lead free epoxy coated, stainless steel trim, Buna-N elastomer seat 160 deg F, adjustable reduced pressure range, flanged ANSI Class 150, 250 psig operating pressure, with integral or low flow bypass of 1 gpm or less. Include wye strainer. Pre-set for the scheduled pressure. Watts, Cla-Val, Apollo/Conbraco, Zurn/Wilkins, Victaulic/Bermad.
- C. Safety Relief Valves:
 1. Manufacturers: Bell & Gossett, Apollo/Conbraco, Watts, Zurn/Wilkins
 2. Bronze body, temperature and pressure actuated stainless steel stem and spring, thermostat with non-metallic coating, test lever, suitable for 125 psig water working pressure at 240 degrees F, sized for full BTUH input and operating pressure of equipment, with valve capacity on metal label. For equipment less than or equal to 200,000 BTUH input, provide AGA, UL or ASME listed and labeled valve. Provide ASME listed and labeled valve for larger equipment. Temperature and pressure relief valve shall be sized using the AGA steam temperature rating per SPS 382.40(5)(d).

PART 3 – EXECUTION

3.01 GENERAL

- A. Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.
- B. Mount valves in locations which allow access for operation, servicing and replacement.
- C. Provide valve handle extensions for all valves installed in insulated piping.
- D. Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.
- E. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT OFF VALVES

- A. Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

3.03 DRAIN VALVES

- A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

3.04 SPRING LOADED CHECK VALVES

- A. Install a spring loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

3.05 SWING CHECK VALVES

- A. Install swing check valves in recirculation branch lines and elsewhere as indicated. Provide weighted swing check valves at sanitary sump pump discharges.

3.06 WATER PRESSURE REDUCING VALVES

- A. Provide ball valve and strainer at inlet and ball valve at outlet. Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve.

3.07 SAFETY RELIEF VALVES

- A. Install relief valves on all pressure vessels and elsewhere as indicated. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger. Pipe discharge to drain where indicated or to floor.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors.
 - 1. Structural Supports
 - 2. Pipe Hangers And Supports
 - 3. Pipe Hanger Rods
 - 4. Beam Clamps
 - 5. Concrete Inserts
 - 6. Continuous Concrete Insert Channels
 - 7. Anchors
 - 8. Equipment Stands
 - 9. Corrosive Atmosphere Coatings

1.03 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 03 10 00 – Concrete Formwork for equipment pads
- C. Section 03 30 00 – Cast-in-Place Concrete for equipment pads
- D. Section 22 07 00 – Plumbing Insulation for insulation protection at support devices

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Structural Supports
 - 2. Pipe Hangers And Supports
 - 3. Pipe Hanger Rods
 - 4. Beam Clamps
 - 5. Concrete Inserts
 - 6. Continuous Concrete Insert Channels
 - 7. Anchors
 - 8. Equipment Stands
 - 9. Corrosive Atmosphere Coatings
- B. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.
- C. All submittals are to comply with submission and content requirements specified within Section 22 05 00 – Common Work Results for Plumbing.

1.05 REFERENCE STANDARDS

- A. MSS SP-58 Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, And Installation.

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.

1.07 DESCRIPTION

- A. Provide all supporting devices as required for the installation of plumbing equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.
- B. Do not hang any plumbing item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.
- C. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.
- D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
- E. Protect insulation at all hanger points; see Related Work above.

1.08 DESIGN CRITERIA

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 unless noted otherwise.
- B. Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

PART 2 – PRODUCTS

2.01 STRUCTURAL SUPPORTS

- A. Provide all supporting steel required for the installation of plumbing equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

2.02 PIPE HANGERS AND SUPPORTS

- A. Manufacturers: Anvil, B-Line, Grinnell, Pate, Piping Technology, Roof Products & Systems.
- B. Hangers for Pipe Sizes 1/2" through 2":
 - 1. Carbon steel, adjustable swivel ring.
 - 2. Carbon steel, adjustable clevis, standard.
- C. Hangers for Pipe Sizes 2" and Larger:
 - 1. Carbon steel, adjustable clevis, standard.
- D. Multiple or Trapeze Hangers:
 - 1. Steel channels with welded spacers and hanger rods.
- E. Wall Support:
 - 1. Carbon steel welded bracket with hanger.
 - 2. Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp.
- F. Vertical Support:
 - 1. Carbon steel riser clamp for above floor use.
- G. Floor Support:
 - 1. Carbon steel pipe saddle, stand and bolted floor flange.
- H. Copper Pipe Supports:
 - 1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

2.03 PIPE HANGER RODS

- A. Steel Hanger Rods:
 - 1. Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

2.04 BEAM CLAMPS

- A. MSS SP-58 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw.
- B. MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter.

2.05 CONCRETE INSERTS

- A. Poured in Place:
 1. MSS SP-58 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity.
 2. MSS SP-58 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter.
- B. Drilled Fasteners:
 1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.06 CONTINUOUS CONCRETE INSERT CHANNELS

- A. Steel inserts with an industry standard pre-galvanized finish, nominally 1-5/8 inch wide by 1-3/8 inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices. Installed channels to provide a load rating of 2000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed to be used with the channel inserts may be used. Select insert length to accommodate all pipe in the area.

2.07 ANCHORS

- A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.08 EQUIPMENT STANDS

- A. Use structural steel members welded to and supported by pipe supports. Clean, prime and coat with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather, treat with corrosive atmosphere coatings.

2.09 CORROSIVE ATMOSPHERE COATINGS

- A. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.
- B. Corrosive atmospheres include the following locations:
 1. Exterior locations

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.
- B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.
- C. Coordinate hanger and support installation to properly group piping of all trades.
- D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.
- E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.
- F. Perform welding in accordance with standards of the American Welding Society.

3.02 HANGER AND SUPPORT SPACING

- A. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- B. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.
- C. Use hangers with 1-1/2 inch minimum vertical adjustment.
- D. Support riser piping independently of connected horizontal piping.
- E. Greater hanger support distances may be used for CPVC and PEXa piping systems where metallic carrier channels are used in conformance with the manufacturer's recommendations and meet all code requirements.
- F. Adjust hangers to obtain the slope specified in the piping section of these specifications.
- G. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Cast Iron	2" and larger	5'-0"	15'-0"
Copper	½" through ¾"	5'-0"	10'-0"
Copper	1" through 1¼"	6'-0"	10'-0"
Copper	1½" through 2½"	8'-0"	10'-0"
Copper	3"	10'-0"	10'-0"
Copper	4" and larger	12'-0"	10'-0"
Ductile Iron	All	10'-0"	20'-0"
Steel	½" through 1¼"	7'-0"	15'-0"
Steel	1½" through 6"	10'-0"	15'-0"
Plastic (DWV)	1½" and larger	4'-0"	10'-0"
Plastic	1" and smaller	32"	4'-0"
Plastic	1¼" and over	4'-0"	6'-0"
Stainless Steel	1" – 2"	10'-0"	10'-0"
Stainless Steel	2 ½" and larger	10'-0"	10'-0"

3.03 RISER CLAMPS

- A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.04 CONCRETE INSERTS AND CONTINUOUS INSERT CHANNELS

- A. Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Locate continuous insert channels on 6'-0" maximum centers and 2'-0" from corners. Furnish inserts to the General Contractor for placement in concrete formwork. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide

hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

3.05 ANCHORS

- A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

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**SECTION 22 07 00
PLUMBING INSULATION**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes insulation specifications for plumbing piping and equipment.
 - 1. Insulation:
 - a. Rigid Fiberglass Insulation
 - b. Semi-Rigid Fiberglass Insulation
 - c. Elastomeric Insulation
 - d. Fireproofing Insulation
 - 2. Covers and Jackets
 - 3. Insulation Inserts And Pipe Shields
 - 4. Accessories

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 22 05 00 – Common Work Results for Plumbing
- C. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment
- D. Section 22 11 00 – Facility Water Distribution
- E. Section 22 13 00 – Facility Sanitary Sewerage
- F. Section 22 30 00 – Plumbing Equipment

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Insulation
 - a. Rigid Fiberglass Insulation
 - b. Semi-Rigid Fiberglass Insulation
 - c. Elastomeric Insulation
 - d. Fireproofing Insulation
 - 2. Covers and Jackets
 - 3. Insulation Inserts And Pipe Shields
 - 4. Accessories
- B. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.05 REFERENCE STANDARDS

- A. ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate
- B. ASTM C165 Test Method for Compressive Properties of Thermal Insulations
- C. ASTM C177 Heat Flux and Thermal Transmission Properties
- D. ASTM C195 Mineral Fiber Thermal Insulation Cement
- E. ASTM C240 Cellular Glass Insulation Block
- F. ASTM C302 Density of Preformed Pipe Insulation
- G. ASTM C303 Density of Preformed Block Insulation
- H. ASTM C449 Mineral Fiber Hydraulic Setting Thermal Insulation Cement
- I. ASTM C518 Heat Flux and Thermal Transmission Properties

- J. ASTM C533 Calcium Silicate Block and Pipe Thermal Insulation
- K. ASTM C534 Preformed Flexible Elastomeric Thermal Insulation
- L. ASTM C547 Mineral Fiber Preformed Pipe Insulation
- M. ASTM C552 Cellular Glass Block and Pipe Thermal Insulation
- N. ASTM C553 Mineral Fiber Blanket and Felt Insulation
- O. ASTM C578 Preformed, Block Type Cellular Polystyrene Thermal Insulation
- P. ASTM C591 Preformed Rigid Cellular Polyurethane Thermal Insulation
- Q. ASTM C610 Expanded Perlite Block and Thermal Pipe Insulation
- R. ASTM C612 Mineral Fiber Block and Board Thermal Insulation
- S. ASTM C921 Properties of Jacketing Materials for Thermal Insulation
- T. ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation
- U. ASTM E84 Surface Burning Characteristics of Building Materials
- V. MICA National Commercial & Industrial Insulation Standards
- W. NFPA 225 Surface Burning Characteristics of Building Materials
- X. UL 723 Surface Burning Characteristics of Building Materials

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.07 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 22 05 00 – Common Work Results for Plumbing.
- B. In addition to the general content specified in Section 22 05 00 – Common Work Results for Plumbing, supply the following additional documentation:

1.08 DESCRIPTION

- A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:
 - 1. Pipe Insulation
 - 2. Equipment Insulation
- B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Owner's Project Representative.

1.09 DEFINITIONS

- A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials or accessories containing asbestos will not be accepted.
- B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:
 - 1. Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.02 INSULATION AND JACKETS

- A. Manufacturers: Armstrong, Certainteed, Manson, Childers, Dow, Extol, Halstead, H.B. Fuller, Imcoa, Knaf, Owens-Corning, Pittsburgh Corning, Rubatex, Johns-Mansville, Armacell, or approved equal.

- B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.
- C. Rigid Fiberglass Insulation:
 - 1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.
 - 2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.
- D. Semi-Rigid Fiberglass Insulation:
 - 1. Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.
 - 2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.
- F. Elastomeric Insulation:
 - 1. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20 degrees F to 220 degrees F on piping and 180 degrees F where adhered to equipment.
- G. Fireproofing Insulation:
 - 1. Mineral fiber with nominal density of 8 lbs. per cu. ft., flame spread index of 15, fuel contribution index of 0, and smoke developed index of 0, thermal conductivity of not more than 0.23 at 75 degrees F.
 - 2. Jacket material shall be the same as jacket for adjacent insulation.
- H. PVC Fitting Covers and Jackets:
 - 1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535E, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).
- I. Metal Jackets:
 - 1. .016 inch thick pebble finish aluminum or .010 inch thick stainless steel with safety edge.

2.03 INSULATION INSERTS AND PIPE SHIELDS

- A. Manufacturers: B-Line, Pipe Shields, Value Engineered Products
- B. Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12" and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom of supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.
- C. Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered pre-manufactured product described above. On low temperature systems, extruded polystyrene may be substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for lower insulation compressive strength.
- D. Precompressed 20# density molded fiberglass blocks, Hamfab, of same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1" x 6" block for piping through 2-1/2" and three 1" x 6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.
- E. Wood blocks will not be accepted.

2.04 ACCESSORIES

- A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be .015 inch for aluminum and .010 inch for stainless steel.
- D. Tack fasteners to be stainless steel ring grooved shank tacks.
- E. Staples to be clinch style.
- F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
- G. Finishing cement to be ASTM C449.
- H. Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.
- I. Bedding compounds to be non-shrinking and permanently flexible.
- J. Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.
- K. Fungicidal water base coating (Foster 40-20) to be compatible with vapor barrier coating.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install insulation, jackets and accessories in accordance with manufacturer's instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.
- B. Do not insulate systems or equipment which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.
- C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Cover and seal exposed fiberglass insulation when insulation is terminated, no raw fiberglass insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.
- D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
- E. Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.
- F. Insulation shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous through all penetrations.
- G. Provide a complete vapor barrier for insulation on the following systems:
 - 1. Cold water (potable and non-potable)
 - 2. Equipment piping with a surface temperature below 65 degrees F

3.02 PIPING, VALVE AND FITTING INSULATION

- A. General:
 - 1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.
 - 2. Water supply piping insulation shall be continuous throughout the building and installed adjacent to and within building walls to a point directly behind the fixture that is being supplied.
 - 3. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.
- B. Insulation Inserts and Pipe Shields:
 - 1. Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.
- C. Fittings and Valves:
 - 1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150 degrees, PVC fitting covers.

Secure PVC fitting covers with tack fasteners and 1-1/2" band of mastic over ends, throat, seams or penetrations. On systems requiring vapor barrier, use vapor barrier mastic.

- D. Elastomeric:
 1. Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. Apply full bed of adhesive to both surfaces.
- E. Polyolefin:
 1. Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For polyolefin, seal factory preglued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces.
- F. Protective Jackets:
 1. Provide a protective PVC jacket for the following insulated piping: Exposed in food handling/kitchen areas, wet areas, where insulation is subject to physical abuse, where insulated piping is exposed to public and lower than 10'-0" above finished floor, or where painted finish is required.
 - a. Lap seams and joints a minimum of 2 inches and continuously seal with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used.
 2. Provide a protective metal jacket for the following insulated piping: Exterior installations.
 - a. Lap seams a minimum of 2 inches. Secure with metal bands for end-to-end joints, and rivets or sheet metal screws for longitudinal joints. Rivets, screws, and bands to be constructed of the same material as the jacket. Locate seams on bottom for exterior applications.
 3. Provide a protective covering of 2 coats of indoor/outdoor vapor barrier mastic with fabric reinforcing for insulated piping where painted finish is required.
- G. Pipe Insulation Schedule:
 1. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation Types	Insulation Thickness by Pipe Size					
		1" and smaller	1-1/4" to 2"	2-1/2" to 4"	5" to 6"	8" and larger	
Hot Water Supply	Rigid Fiberglass	1"	1"	1.5"	1.5"	1.5"	
Hot Water Return	Rigid Fiberglass	1"	1"	1.5"			
Cold Water	Rigid Fiberglass	0.5"	0.5"	1"	1"	1"	
Tempered Water	Rigid Fiberglass	0.5"	0.5"	1"			

2. The following piping and fittings are not to be insulated:
 - a. Chrome plated exposed supplies and stops (except where specifically noted).
 - b. Water hammer arrestors.
 - c. Piping unions and flanges for systems not requiring a vapor barrier.

3.03 EQUIPMENT INSULATION

- A. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.
- B. Semi-Rigid Fiberglass:
 1. Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface. Cover with reinforcing fabric and 2 coats of mastic. Use vapor barrier mastic on systems requiring a vapor barrier.
- C. Elastomeric:
 1. Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.
- D. Equipment Insulation Schedule:
 1. Provide equipment insulation as follows:

Equipment	Insulation Type	Thickness	Remarks
Water Meter	Elastomeric	0.5"	Sheet type, fabricated for ease of removal and replacement when service is required.
Water Softener	Elastomeric	0.5"	Sheet type, fabricated for ease of removal and replacement when service is required.

END OF SECTION

**SECTION 22 11 00
FACILITY WATER DISTRIBUTION**

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section contains specifications for plumbing pipe and pipe fittings for this project.
 - 1. Domestic Water
 - 2. Dielectric Unions And Flanges
 - 3. Unions And Flanges
 - 4. Press Fitting Pipe Connections
 - 5. Mechanical Grooved Pipe Connections
 - 6. Piping System Leak Tests

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 22 05 14 – Plumbing Specialties
- C. Section 22 05 15 – Piping Specialties
- D. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Domestic Water
 - 2. Dielectric Unions And Flanges
 - 3. Unions And Flanges
 - 4. Press Fitting Pipe Connections
 - 5. Mechanical Grooved Pipe Connections
 - 6. Piping System Leak Tests
- B. Schedule from the contractor indicating the ASTM or AWWA specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.
- C. Statement from manufacturer on letterhead that pipe furnished meets the ASTM or AWWA specification contained in this section.

1.05 REFERENCE STANDARDS

- A. ANSI A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. ANSI A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C. ANSI A21.51 Ductile-Iron Pipe, Centrifugally Cast
- D. ANSI B16.3 Malleable Iron Threaded Fittings
- E. ANSI B16.4 Cast Iron Threaded Fittings
- F. ANSI B16.5 Pipe Flanges and Flanged Fittings
- G. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
- H. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
- I. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
- J. ASTM A105 Forgings, Carbon Steel, for Piping Components
- K. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
- L. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- M. ASTM B32 Solder Metal

- N. ASTM B88 Seamless Copper Water Tube
- O. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- P. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
- Q. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe
- R. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
- S. ASTM D2464 Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
- T. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
- U. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
- V. ASTM D2657 Heat Fusion Joining of Polyolefin Pipe and Fittings
- W. ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
- X. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
- Y. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- Z. ASTM D3222 Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials
- AA. ASTM D4101 Propylene Plastic Injection and Extrusion Materials
- BB. ASTM E84 Surface Burning Characteristics of Building Materials
- CC. ASTM F437 Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80
- DD. ASTM F438 Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40
- EE. ASTM F441 Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80
- FF. ASTM F493 Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings
- GG. ASTM F656 Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
- HH. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing
- II. ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
- JJ. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings
- KK. AWS A5.8 Brazing Filler Metal
- LL. AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
- MM. AWWA C105 Polyethylene Encasement for Ductile Iron Piping for Water
- NN. AWWA C110 Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
- OO. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
- PP. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
- QQ. AWWA C153 Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids
- RR. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances
- SS. AWWA C606 Grooved and Shouldered Joints
- TT. AWWA C651 Disinfecting Water Mains
- UU. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
- VV. AWWA C904 Standard for Crosslinked Polyethylene (PEX) Pressure Pipe, 1/2-inch Through 3-inch, for Water Service
- WW. NSF 372 Drinking Water System Components – Lead Content

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.
- C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

1.07 DESIGN CRITERIA

- A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM or AWWA specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system.
- C. Non-metallic piping will be acceptable only for the services indicated. Non-metallic piping will be acceptable in ventilation plenum spaces, including plenum ceilings, when the installed system including insulation and support is certified in compliance with ASTM E84.
- D. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.
- E. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

PART 2 – PRODUCTS

2.01 DOMESTIC WATER

- A. Above Ground:
 - 1. Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Copper mechanical grooved fittings and couplings on roll grooved pipe may be used in lieu of soldered fittings. Press fitting pipe connections may be used in lieu of soldered fittings. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for branch takeoffs up to one-half (1/2) the diameter of the main.
 - 2. Stainless Steel Pipe:
 - a. 2" and smaller: NSF 61 and NSF 372, FM approved ASTM A312, Type 304, Schedule 10S pipe, dimensions conforming to ANSI/ASME B36.19M.
 - 1) Fittings: Press style fittings with ASTM A312 stainless steel housings, ASTM A276 and A312 outlets and austenitic stainless steel plain or grooved ends, Type 304. Complete with synthetic rubber Grade E seals. Suitable for working pressure to 500 psig. Victaulic Vic-Press for Schedule 10S Pipe.
 - b. 2-1/2" and larger: NSF 61, ASTM A312, Type 304/304L Schedule 10 stainless steel pipe. Roll grooved.
- B. Below Ground 2-1/2" and Smaller:
 - 1. Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.
- C. Below Ground 3" and Larger:
 - 1. Ductile iron pipe, mechanical or push on joint, thickness Class 52, AWWA C151; with standard thickness cement mortar lining, AWWA C104; ductile iron or gray iron mechanical joint cement mortar lined fittings, Class 250, AWWA C110; ductile iron mechanical joint compact fittings, Class 350, AWWA C153; rubber gasket joints with non-toxic gasket lubricant, AWWA C111. Provide 8 mil tube or sheet polyethylene encasement of iron pipe and pipe fittings, AWWA C105.

2. PVC pressure pipe, DR 18, Class 150, AWWA C900 and C905; with integral bell and elastomeric gaskets, ASTM D3139. Fittings and fitting polyethylene encasement to be same as noted above for ductile iron.
- D. Underground to Interior Building Entrance Piping 3" and larger:
 1. Ductile iron as specified above with factory threaded and machined flanges.
- E. Thrust Restraints for Underground Piping:
 1. Asphaltic or epoxy coated ductile iron follower gland mechanical joint restraint with gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference, low alloy steel T-bolts and UL listing or Factory Mutual approval. For PVC pipe joint bells, use epoxy or primer coated ductile iron bell and serrated ring restraints or gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference with low alloy steel tie bolts. Restraint to have minimum pressure rating and safety factor equal to or greater than pressure rating and safety factor of pipe and be designed specifically for the pipe material it's applied on.

2.02 DIELECTRIC UNIONS AND FLANGES

- A. Manufacturers: Victaulic, Watts, Lochinvar, Wilkins or EPCO Sales, Inc.
- B. Dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees. Watts LF301.
- C. Dielectric Waterway: Fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF 61 for potable water service. Fittings shall have threaded ends, grooved ends, or a combination. Victaulic Style 647.

2.03 UNIONS AND FLANGES

- A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees Fahrenheit. Gasket material for flanges and flanged fittings shall be Teflon type. Treated paper gaskets are not acceptable.
 1. Unions or flanges for servicing and disconnecting are not required in installations using grooved joint couplings.
- B. 2" and Smaller Steel:
 1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.
 2. Stainless steel hexagonal threaded type union with press fitting pipe connections, suitable for working pressure to 500 psig, Victaulic Style P584.
- C. 2" and Smaller Copper:
 1. ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.
- D. 2-1/2" and Larger Steel:
 1. ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face Teflon gaskets for mating with other flat face flanges on equipment. Gaskets shall be Teflon type.
- E. 2-1/2" and Larger Copper:
 1. ANSI B15.24 Class 150 cast bronze flanges with full face Teflon gaskets.

2.04 PRESS FITTING PIPE CONNECTIONS

- A. Manufacturer: Viega, Victaulic, Apollo or approved manufacturer.
- B. All press fitting materials including o-rings, couplings, fittings and adapters shall be from the same manufacturer.
- C. Bronze press fittings for copper tubing shall conform to the material and sizing, requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Maximum operating pressure of 200 psi.

2.05 MECHANICAL GROOVED PIPE CONNECTIONS

- A. Manufacturers: Victaulic or approved equal

- B. Mechanical grooved pipe couplings and fittings, ASTM F1476, may be used with cut groove galvanized steel pipe, cut groove ductile iron pipe, roll grooved stainless steel pipe, or roll groove copper pipe where noted. Mechanical grooved components and assemblies to be rated for minimum 250 psi working pressure.
- C. All mechanical grooved pipe material including gaskets, couplings, fittings, flange adapters and specialties, shall be from the same manufacturer.
- D. All castings used for couplings, housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.
- E. Couplings shall consist of two ductile iron ASTM A536 housings with painted finish. Reducing couplings are not acceptable.
 - 1. Copper Tubing: Housings cast with offsetting angle-pattern bolt pads, with blue enamel coating. Installation-ready, for direct stab installation without field disassembly. Victaulic Style 607.
 - 2. Stainless Steel or Galvanized Steel Pipe: Housings with blue enamel coating. Installation ready, for direct stab installation without field disassembly.
 - a. Rigid Type: Housings cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style 807N.
 - b. Flexible Type: For use in locations where vibration attenuation and stress relief are required. Victaulic Style 877N.
 - 3. Ductile Iron Pipe: Housings with orange enamel coating, with flush gasket suitable for potable water. Victaulic Style 31.
- F. Fittings used on galvanized steel pipe shall be ductile iron ASTM A536, with galvanized finish, ASTM A153. Fittings used on ductile iron pipe to be cement mortar lined ductile iron with coal tar coating, ASTM A536; conforming to requirements of AWWA C110/C153 and AWWA C606. Fittings used on copper pipe shall be wrought copper or cast bronze with copper-tube dimensioned ends. Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.
- G. Gaskets shall be fluoroelastomer center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and insertion depth. Gaskets for use with ductile iron piping systems to be flush seal design, grade suitable for potable water.
- H. Heat treated carbon steel oval neck track bolts and nuts shall be ASTM A449 and A183, with zinc electroplated finish ASTM B633.
- I. Flange adapters shall be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used. Victaulic Style 641 (copper tubing systems), Style 741 (steel pipe systems), and Style 341 (ductile iron systems).
- J. Credit for the inherent flexibility of mechanical grooved pipe connections when used for expansion joints or flexible connectors may be allowed upon specific application by the Contractor. Three flexible couplings at first three connection points both upstream and downstream of pumps may be used in lieu of flexible connectors. Request for expansion joints shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for the intended service.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

- A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field,

offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

- B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.
- C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.
- D. Maintain piping in clean condition internally during construction.
- E. Provide clearance for installation of insulation, access to valves and piping specialties.
- F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- G. Do not route piping through transformer vaults or above transformers, panelboards or switchboards, including the required service space for this equipment.
- H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

- A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

- A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 MECHANICAL JOINT PIPE CONNECTIONS

- A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.07 PUSH-ON GASKETED PIPE CONNECTIONS

- A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Insure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.08 MECHANICAL GROOVED PIPE CONNECTIONS

- A. Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved pipe in accordance with the same specifications using specially designed tools designed for the application. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Contractor shall remove and replace any improperly installed products.
- B. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. The factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed.

3.09 PRESS FITTING PIPE CONNECTIONS

- A. Press fitting connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark of the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.10 MECHANICALLY FORMED TEE FITTINGS

- A. Form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Braze the joint with neutral flame oxy-acetylene torch, applying heat properly so that pipe and tee do not distort; remove distorted connections.

3.11 DOMESTIC WATER

- A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.
- B. Install exterior water piping below predicted frost level, but in no case less than 6 feet bury depth to top of pipe. Maintain minimum of 8 feet horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10 feet from sewer in both directions.
- C. Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Field apply continuous anti-corrosion coating to rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover. Cover with 8 mil sheet or tube polyethylene material sleeve.
- D. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.
- E. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.
- F. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.12 UNDERGROUND PIPE WRAP

- A. Use for steel piping encased in concrete or underground which is not in a conduit. Remove all dirt and other foreign material from exterior of pipe. Apply primer as recommended by the manufacturer. Use a spiral wrap process for applying tape to the pipe. Repair any breaks in the tape coating caused by the installation process.

3.13 DIELECTRIC UNIONS AND FLANGES

- A. Install dielectric unions or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.14 UNIONS AND FLANGES

- A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of

equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.15 PIPING SYSTEM LEAK TESTS

- A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.
- B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.
- C. For hydrostatic tests, use clean water and remove all air from the piping being tested. Measure and record test pressure at the high point in the system.
- D. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test. Caulking will not be acceptable.
- E. Entire test must be witnessed by the Owner's representative. All pressure tests are to be documented on form included in specification.

<u>Test System</u>	<u>Medium</u>	<u>Initial Test</u>		<u>Final Test</u>	
		<u>Pressure</u>	<u>Duration</u>	<u>Pressure</u>	<u>Duration</u>
*Below Ground Domestic Water	Water	N/A		200 psig	2 hr.
Above Ground Domestic Water	Water	N/A		100 psig	8 hr.
Above Ground Non-potable Water	Water	N/A		100 psig	8 hr.
Below Ground Non-potable Water	Water	N/A		100 psig	8 hr.

*Flush and hydrostatically test underground water service piping in accordance with NFPA 13 – Installation of Sprinkler Systems, latest edition. All pressure tests shall be documented on NFPA Contractor's Material and Test Certificate for Underground Piping forms. These forms are to be included in the O&M manual.

END OF SECTION

PIPING SYSTEM TEST REPORT

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**SECTION 22 13 00
FACILITY SANITARY SEWERAGE**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section contains specifications for plumbing pipe and pipe fittings for this project.
 - 1. Sanitary Waste And Vent
 - 2. Piping System Leak Tests

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 22 05 14 – Plumbing Specialties
- C. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Sanitary Waste And Vent
 - 2. Piping System Leak Tests
- B. Schedule from the contractor indicating the ASTM or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.
- C. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, or CISPI specification contained in this section.

1.05 REFERENCE STANDARDS

- A. ANSI A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. ANSI A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C. ANSI A21.51 Ductile-Iron Pipe, Centrifugally Cast
- D. ANSI B16.3 Malleable Iron Threaded Fittings
- E. ANSI B16.4 Cast Iron Threaded Fittings
- F. ANSI B16.5 Pipe Flanges and Flanged Fittings
- G. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
- H. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
- I. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
- J. ASTM A74 Cast Iron Soil Pipe and Fittings
- K. ASTM A105 Forgings, Carbon Steel, for Piping Components
- L. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
- M. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- N. ASTM A861 High Silicon Iron Pipe and Fittings
- O. ASTM A888 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- P. ASTM B32 Solder Metal
- Q. ASTM B306 Copper Drainage Tube (DWV)
- R. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
- S. ASTM C76 Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe
- T. ASTM C564 Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings

- U. ASTM C1540 Standard Specifications for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings
- V. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe
- W. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
- X. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
- Y. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
- Z. ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
- AA. ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
- BB. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
- CC. ASTM D3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
- DD. ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- EE. ASTM D3311 Drain, Waste and Vent (DWV) Plastic Fitting Patterns
- FF. ASTM F2618 CPVC Pipe and Fittings for Chemical Waste Drainage
- GG. ASTM E84 Surface Burning Characteristics of Building Materials
- HH. CISPI 301 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications
- II. CISPI 310 Couplings For Use In Connection With Hubless Cast Iron Soil Pipe And Fittings For Sanitary And Storm Drain, Waste And Vent Piping Applications

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.
- C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

1.07 DESIGN CRITERIA

- A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, or CISPI specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system.
- C. Non-metallic piping will be acceptable only for the services indicated. Non-metallic piping will be acceptable in ventilation plenum spaces, including plenum ceilings, when the installed system including insulation and support is certified in compliance with ASTM E84.
- D. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.
- E. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

PART 2 – PRODUCTS

2.01 SANITARY WASTE AND VENT

- A. Interior Above Ground:

1. Hubless cast iron soil pipe and fittings, ASTM A888, CISPI 301; with heavy-duty shielded stainless steel no-hub couplings, CISPI 310, ASTM C1540, ASTM C564, Anaco-Husky HD2000, Clamp-All Hi-Torq 125, Ideal Tridon HD Yellow. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - a. Manufacturers: A B & I Foundry, Charlotte Pipe and Foundry, Tyler Pipe
 2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for vent branch takeoffs up to one-half (1/2) the diameter of the main.
 3. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
 4. CPVC plastic pipe, Schedule 40, ASTM D1784, Class 23447 Type IV, with drainage pattern fittings per ASTM D3311, Solvent cement joints utilizing one step primerless cement as approved by the manufacturer. All fittings and pipe shall be tested and listed in accordance with CAN/ULC S102.2 and tested in general accordance with ASTM E-84/UL723 for flame spread of <25 and smoke development of <50. CPVC pipe and fittings shall be of Charlotte Chem Drain or Spears Lab Waste manufacturers, or equal.
- B. Interior Below Ground:
1. Hubless cast iron soil pipe and fittings, ASTM A888, CISPI 301; with heavy-duty shielded stainless steel no-hub couplings, CISPI 310, ASTM C1540, ASTM C564, Anaco-Husky HD2000, Clamp-All Hi-Torq 125, Ideal Tridon HD Yellow. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - a. Manufacturers: A B & I Foundry, Charlotte Pipe and Foundry, Tyler Pipe
 2. Hub and spigot cast iron soil pipe and fittings, service weight, ASTM A74, with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - a. Manufacturers: A B & I Foundry, Charlotte Pipe and Foundry, Tyler Pipe
 3. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
 4. CPVC plastic pipe, Schedule 40, ASTM D1784, Class 23447 Type IV, with drainage pattern fittings per ASTM D3311, Solvent cement joints utilizing one step primerless cement as approved by the manufacturer. All fittings and pipe shall be tested and listed in accordance with CAN/ULC S102.2 and tested in general accordance with ASTM E-84/UL723 for flame spread of <25 and smoke development of <50. CPVC pipe and fittings shall be of Charlotte Chem Drain or Spears Lab Waste manufacturers, or equal.
- C. Exterior Below Ground 15" and Smaller:
1. Hubless cast iron soil pipe and fittings, ASTM A888, CISPI 301; with heavy-duty shielded stainless steel no-hub couplings, CISPI 310, ASTM C1540, ASTM C564, Anaco-Husky HD2000, Clamp-All Hi-Torq 125, Ideal Tridon HD Yellow. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - a. Manufacturers: A B & I Foundry, Charlotte Pipe and Foundry, Tyler Pipe
 2. Hub and spigot cast iron soil pipe and fittings, service weight, ASTM A74, with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - a. Manufacturers: A B & I Foundry, Charlotte Pipe and Foundry, Tyler Pipe
 3. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
 4. Type PSM PVC sewer pipe and socket fittings, SDR 35, Class 12454-B (PVC 1120), ASTM D3034; primer, ASTM F656; solvent cement, ASTM 2564; or integral bell and flexible elastomeric seal, ASTM D3212.
 5. Corrugated PVC pipe and fittings with smooth interior, ASTM F949; gasketed joint, ASTM D3212; elastomeric gasket, ASTM F477.

6. Non-reinforced concrete sewer, storm drain and culvert pipe, Class III, ASTM C14; rubber gasket joints, ASTM C443; bell and spigot ends with opposing shoulder or confined O-ring seal configuration, ASTM C302.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations and recognized industry practices.

3.02 PREPARATION

- A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.
- B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.
- C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.
- D. Maintain piping in clean condition internally during construction.
- E. Do not route piping through transformer vaults or above transformers, panelboards or switchboards, including the required service space for this equipment.
- F. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.
- G. Install heavy-duty transition coupling when joining no-hub cast iron and PVC pipe, ASTM C1460 with ASTM C564 gasket, Husky SD4200 PVCxCI.

3.04 COPPER PIPE JOINTS

- A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

- A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 SOLVENT WELDED PIPE JOINTS

- A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

- B. Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturer's recommendations for initial set time before handling and for full curing time before pressure testing.
- C. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Owner's Project Representative. Solvent welded pipe joints are not permitted to be made below 40 degrees.

3.07 MECHANICAL HUBLESS PIPE CONNECTIONS

- A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturers recommended torque.

3.08 SANITARY WASTE AND VENT

- A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4" per foot where possible and in no case less than 1/8" per foot for piping 3" and larger.
- B. Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection.
- C. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

3.09 PIPING SYSTEM LEAK TESTS

- A. For hydrostatic tests, use clean water and remove all air from the piping being tested. Measure and record test pressure at the high point in the system.
- B. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.
- C. Entire test must be witnessed by the Owner's representative. All pressure tests are to be documented.

<u>System</u>	<u>Test Medium</u>	<u>Initial Test</u>		<u>Final Test</u>	
		<u>Pressure</u>	<u>Duration</u>	<u>Pressure</u>	<u>Duration</u>
Sanitary Waste and Vent	Water	N/A		10' water	2 hr.

END OF SECTION

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**SECTION 22 30 00
PLUMBING EQUIPMENT**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.
- B. See Schedules and Details on Drawings for models and capacities.

1.02 SECTION INCLUDES

- A. This section includes specifications for water heaters, water softeners, pumps and other equipment used for plumbing applications.
 - 1. Residential Electric Water Heaters
 - 2. Water Softeners

1.03 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 22 05 15 - Piping Specialties
- C. Section 22 05 23 - General-Duty Valves for Plumbing Piping
- D. Section 22 07 00 - Plumbing Insulation
- E. Division 26 - Electrical

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 - Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Residential Electric Water Heaters
 - 2. Water Softeners
- B. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 FUNCTIONAL TESTS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Functional Tests. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following functional tests:
 - 1. Residential Electric Water Heaters

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Plumbing products requiring approval by the State of Wisconsin Dept. of Safety & Professional Services must be approved or have pending approval at the time of shop drawing submission.

1.07 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under in Section 22 05 00 – Common Work Results for Plumbing.

PART 2 – PRODUCTS

2.01 RESIDENTIAL ELECTRIC WATER HEATERS

- A. Manufacturers: A.O. Smith, American, Bradford White, Lochinvar, Rheem, Ruud, State.
- B. Type: Electric storage domestic water heater. Design to be UL listed with 3 year commercial use tank warranty and 1 year parts warranty.

- C. Efficiency:
 - 1. 20 gallons and <12 kW 0.94 Minimum Energy Factor
 - 2. >30 gallons and <12 kW 0.93 Minimum Energy Factor
- D. Tank: Steel glass lined tank rated for 150 psig complete with removable magnesium anode rod, plastic diffuser type dip tube, inlet and outlet heat trap fittings, minimum R-20 polyurethane foam insulation, painted steel jacket, drain valve and temperature and pressure relief valve.
- E. Elements: Dual 4500 watt heating elements to be replaceable threaded low watt density incoloy sheath with adjustable thermostat control, energy cutoff and wired for non-simultaneous operation.

2.02 WATER SOFTENERS

- A. Manufacturers: Amtrol, Capital, Custom-Care, Hellenbrand, Water Right.
- B. Tanks: Fiberglass reinforced mineral tank constructed of molded high density polyethylene inner shell reinforced by exterior fiberglass winding and epoxy resin. NSF approved and rated for 150 psig. Mount slotted or lateral hub PVC distributor in tank with underbedding gravel.
- C. Mineral: High capacity ion exchange mineral, FDA approved, Sybron/Ionac, Rohm & Haas, Resintech or Puralite. Uniform beads rated for removal of 30,000 grains of hardness as calcium carbonate when regenerated with 15 lbs. of salt. Design for minimum 50% resin bed freeboard.
- D. Valve: Top mount brass valve with motor drive, hydraulically balanced piston, seal and spacers, adjustable brine flow control, backwash flow control, adjustable capacity and regeneration settings. Provide bypass ball valve arrangement.
- E. Controls: Factory wired and tested controls with transformer and labeled terminal block for single consisting of the following:
 - 1. Mechanical Demand Meter Delayed Regeneration
- F. Brine Tank: High density polyethylene brine tank with high salt platform, PVC brine measuring and float valve, PVC injector. Contractor to provide initial salt fill.
- G. Ratings: Maximum 10 MG/L hardness leakage, 110° F maximum operating temperature, 30-100 psig operating pressure, 120/60/1 electrical.
- H. Accessories:
 - 1. Flexible braided stainless steel pipe connectors for tanks over 24" in diameter.
 - 2. Inlet and outlet sampling valves, inlet and outlet pressure gauges with shutoff valve.
 - 3. Resin defoulant system with chemical metering pump, tubing and 4 month supply of chemical cleaner for iron and bacteria fouling.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment where indicated in accordance with manufacturer's recommendations. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment and arrange plumbing piping to provide access space for servicing all components.
- B. Set commercial water heaters, commercial water softeners, storage tanks and booster pumps on concrete housekeeping pads. Adjust and level equipment.
- C. Connect equipment to water and drain piping using unions or flanges and isolation valves.
- D. Connect pneumatic controls to compressed air source.
- E. Size temperature and relief valves per CSA ratings. Pipe temperature and pressure relief valves to floor drain or floor as indicated.
- F. Startup and test equipment adjusting operating and safety controls for proper operation.
- G. Cycle softeners and adjust for specified exchange rate, regeneration time, consumption, backflow rate, etc. Provide initial salt fill of brine tank.
- H. Adjust compression tank precharge to scheduled minimum operating pressure prior to connecting to system.

3.02 TRAINING

- A. See Section 22 05 00 – Common Work Results for Plumbing for general training requirements.

- B. In addition to the training provided in Section 22 05 00 – Common Work Results for Plumbing, provide an additional 2 hours of training for each type of plumbing equipment provided on the project.

END OF SECTION

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SECTION 22 42 00
COMMERCIAL PLUMBING FIXTURES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Unless noted otherwise, the Plumbing Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for plumbing fixtures, faucets and trim.
 - 1. Plumbing Fixtures
 - a. Drinking Fountains
 - b. Lavatories
 - c. Mop Basins
 - d. Urinals
 - e. Water Closets

1.03 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 01 91 13 – Commissioning Requirements
- C. Section 22 05 14 – Plumbing Specialties
- D. Section 22 11 00 – Facility Water Distribution
- E. Section 22 13 00 – Facility Sanitary Sewerage

1.04 SUBMITTALS

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, Submittals. In addition to the general content specified under Section 22 05 00 – Common Work Results for Plumbing, supply the following submittals:
 - 1. Drinking Fountains
 - 2. Lavatories
 - 3. Mop Basins
 - 4. Urinals
 - 5. Water Closets
- B. Include data concerning sizes, rough in-dimensions, capacities, materials of construction, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 REFERENCE STANDARDS

- A. ANSI A112.6.1M Supports for Off-the-Floor Plumbing Fixtures for Public Use
- B. ANSI A112.18.1 Finished and Rough Brass Plumbing Fixture Fittings
- C. ANSI A112.19.1 Enameled Cast Iron Plumbing Fixtures
- D. ANSI A112.19.2M Vitreous China Plumbing Fixtures
- E. ANSI A112.19.5 Trim for Water Closet Bowls, Tanks and Urinals
- F. ANSI Z124.2 Plastic Shower Receptors and Shower Stalls
- G. ARI-1010 Self-Contained Mechanically Refrigerated Drinking Water Coolers
- H. ASSE 1011 Hose Connection Vacuum Breakers
- I. ASSE 1014 Handheld Showers
- J. ASSE 1016 Individual Thermostatic, Pressure Balancing, and Combination Pressure Balancing and Thermostatic Control Valves for Individual Fixture Fittings

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1.
- B. Plumbing products requiring approval by the State of Wisconsin Dept. of Safety & Professional Services must be approved or have pending approval at the time of shop drawing submission.

1.07 ENERGY EFFICIENCY REQUIREMENTS

- A. Plumbing fixtures must meet the following maximum water usage requirements:
 - 1. Lavatory Faucets, Public: flow of 0.5 gallons per minute, or 0.25 gallons per cycle
 - 2. Urinal Flushometer Valves: 1.0 gallons per flush
 - 3. Water Closet Flushometer Valves: 1.6 gallons per flush

PART 2 – PRODUCTS

2.01 PLUMBING FIXTURES

- A. Manufacturers: Fixture descriptions establish fixture type, quality, materials, features and size. Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted. Architect to select from manufacturer's standard finish colors.
 - 1. Vitreous China and Enameled Cast Iron Fixtures: American Standard, Kohler, Sloan, Toto, Zurn
 - 2. Water Closet Seats: Bemis, Beneke, Centoco, Olsonite Sperzel
 - 3. Faucets: Chicago Faucet, American Standard, Sloan, Zurn, T&S Brass
 - 4. Stops and Supplies: Chicago Faucet, McGuire, Zurn
 - 5. Flushometer Valves: Hydrotek, Delaney, Sloan, Zurn
 - 6. Drains and Traps: Kohler, McGuire, Dearborn, Zurn
 - 7. Carriers and Supports: Josam, J.R. Smith, Wade, Watts, Zurn
 - 8. Drinking Fountains: Elkay, Halsey Taylor, Haws, Oasis, Sunroc
 - 9. Molded Stone Fixtures: Fiat, Mustee
 - 10. Thermostatic Mixing Valves: Bradley, Lawler, Leonard, Powers
- B. Refer to plumbing fixture schedule on drawings for specific selections for basis of design.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.
- B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.
- C. Install barrier free fixtures in compliance with the Wisconsin Building Code and Federal ADA Accessibility Guidelines.
- D. Lavatory and sink p-traps may be installed with offset waste, with p-trap parallel and adjacent to wall. Supplies and stops are elevated to avoid contact by wheelchair users.
- E. Install flexible white molded-vinyl or PVC fixture waste and supply piping protection for all sinks and lavatories with exposed piping, Zurn Z8946-NT, TrueBro LavGuard2, or equal.
- F. Install two-station electric water coolers per manufacturer and ADA guidelines, including bubbler orifice of lower unit not to exceed 36" above finished floor, with cane apron where required. Provide unions at water connections to electric water coolers. Confirm with Architectural elevations.
- G. Where individual toilet rooms contain one or more wall mounted urinals, install one urinal with the lip 17" above finished floor. Install all additional urinals within the same room with the lip 24" above finished floor. Verify mounting heights with Architectural elevations.
- H. Verify mounting height of wall mounted water closets with Architectural elevations. In general, install wall mounted water closets as follows:
 - 1. Non-ADA Fixture rim 15" above finished floor
 - 2. ADA Fixture rim 16½" above finished floor.
- I. Verify with Architectural elevations that water closet flushometer does not conflict with back-wall mounted grab bar.
- J. Water closet trip lever to be installed on wide side of accessible stall.

- K. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.
- L. Cover pipe wall penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, unless otherwise indicated.
- M. Set floor mounted plumbing fixtures, counter mounted sinks, lavatory and sink faucets and drains with full setting bed of flexible non-staining plumber's putty.
- N. Seal wall mounted plumbing fixtures to wall with silicone sealant. Seal mop basins to floor and wall with grout or silicone sealant.
- O. Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.
- P. Adjust lavatory mixing valve outlet water temperature and shower valve temperature limit stops to maximum 105°F.
- Q. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust flush valves for intended water flow rate to fixtures without splashing, noise or overflow. Adjust self-closing faucets to 15 second cycle.
- R. Protect fixtures during construction. At completion clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.

END OF SECTION

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**SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. It is the intent of these specifications to provide complete and workable mechanical systems as shown on the accompanying plans and as specified herein except such parts as are specifically exempted herein. Provide all necessary supervision, coordination, labor, materials, equipment, fixtures, dryage, hoisting, tools, transportation, plant services and facilities, machinery and connections to utilities for the installation of complete and operable mechanical systems. If details or special conditions are required in addition to those shown on drawings, provide all material and equipment usually furnished with such systems or required to complete their installation, whether noted in plans and specification or not.
- B. Materials and labor shall be new (unless noted otherwise), first class and workmanlike and shall be subject at all times to the A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.
- C. The layout shown on the drawings is necessarily diagrammatic but shall be followed as closely as other work will permit. The drawings provide design intent. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. Because of the scale of the Drawings, certain basic items, such as, pipe fittings, duct fittings, access panels, and sleeves, may not be shown. Where such items are required by Code or by other Sections, or where required for proper installation of the Work, such items shall be included, whether shown or not.
- E. In the event of any inconsistencies between the specifications, drawings, contract documents, applicable laws, statutes, ordinances, building codes, rules and regulations, the contractor shall provide the better quality or greater quantity of work and comply with or conform its work to the most stringent legal or contractual requirements.
- F. Changes from these drawings required to make this work conform to the building construction shall be made only with prior written approval of the Architect/Engineer. All proposed changes shall be shown on shop drawings. All measurements shall be verified by actual observation and all work shall fit in place meeting the approval of the Architect/Engineer.
- G. Equipment Specification may not deal individually with minute items required, such as, components, parts, controls, and devices which may be required to produce the equipment performance specified or as required to meet the equipment warranties. Where such items are required to make the system operational, they shall be included by the supplier of the equipment at no additional cost, whether or not specifically called for.

1.02 SECTION INCLUDES

- A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.
 - 1. Submittals
 - 2. Reference Standards
 - 3. Quality Assurance
 - 4. Guarantee
 - 5. Work By Owner
 - 6. Equipment Furnished By Others
 - 7. Provisions For Future
 - 8. Operation And Maintenance Instructions
 - 9. Record Documents
 - 10. Continuity Of Existing Services
 - 11. Protection Of Finished Surfaces
 - 12. Sealing And Firestopping
 - 13. Off Site Storage
 - 14. Regulatory Requirements
 - 15. Certificates And Inspections
 - 16. Coordination

17. Demolition And Existing Requirements
18. Request And Certification For Payment
19. Sleeves And Openings
20. Omissions
21. Definitions
22. Project/Site Conditions
23. Work Sequence And Scheduling
24. Salvage Materials
25. Training
26. Access Panels And Doors
27. Identification
28. Demolition
29. Excavation And Backfill
30. Concrete Work
31. Cutting And Patching
32. Lintels
33. Building Access
34. Equipment Access
35. Lubrication
36. Housekeeping And Clean Up

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. This section applies to all Division 23 sections.

1.04 SUBMITTALS

- A. Submit shop drawings for equipment under each section per requirements listed in that section, as well as per Division 1.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Do not submit hard copies of web pages. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- C. On request from the A/E, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.
- D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- E. The submittals must be approved before fabrication is authorized.
- F. Provide electronic copies of all submittals for review. Electronic submittals shall be sent to wi@henneman.com for review.
- G. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the motor starter schedule is in agreement or indicate any discrepancies. See related comments in Section 23 05 13 in Part 1 under Electrical Coordination.

1.05 REFERENCE STANDARDS

- A. Abbreviations of standards organizations referenced in other sections are as follows:
 1. AABC Associated Air Balance Council
 2. ABMA American Boiler Manufacturers Association
 3. ADC Air Diffusion Council
 4. AMCA Air Movement and Control Association
 5. ANSI American National Standards Institute

6. AHRI	Air-Conditioning, Heating and Refrigeration Institute
7. ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
8. ASME	American Society of Mechanical Engineers
9. ASTM	American Society for Testing and Materials
10. EPA	Environmental Protection Agency
11. ETL	Edison Testing Laboratories
12. FM	Factory Mutual Insurance Company
13. ICC	International Code Council
14. IEEE	Institute of Electrical and Electronics Engineers
15. IRI	Industrial Risk Insurers
16. ISA	Instrument Society of America
17. ISO	International Organization for Standardization
18. MCAA	Mechanical Contractors Association of America
19. MICA	Midwest Insulation Contractors Association
20. NBS	National Bureau of Standards
21. NEBB	National Environmental Balancing Bureau
22. NEC	National Electric Code
23. NEMA	National Electrical Manufacturers Association
24. NFPA	National Fire Protection Association
25. OSHA	Occupational Safety and Health Administration
26. SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
27. TABB	Testing, Adjusting and Balancing Bureau
28. UL	Underwriters Laboratories Inc.

1.06 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1 for equals and substitutions.
 - 1. Where the following conflicts with Division 1, the requirements of Division 1 shall govern.
 - 2. If the Contractor wishes to submit an alternate to the named manufacturers for any equipment, he may submit a voluntary alternative minimum 7 days prior to bid, stating the manufacturer's name, model number, written, detailed product data.
 - 3. Where materials or equipment are specified by name the proposed material or equipment must be identical to the specified material or equipment in all characteristics of quality, function and serviceability, regardless of application in the Project and, in addition, when the Architect deems that aesthetic significance is important, the equal material or equipment must be identical in all characteristics of visual appearance, design, color and texture. Any proposed equal shall be submitted to Architect/Engineer for prior approval, which Architect/Engineer may approve or disapprove in its sole discretion. Work performed or constructed with unapproved equals is at Contractor's risk and any required correction of work incorporating unapproved equals shall be at Contractor's sole cost and expense.
 - 4. In all instances, Contractor shall assume full responsibility for proof of equality of the statute to the equipment hereinafter specified. All data and information necessary for proof of equality, function and space requirements shall be prepared and accompany the submittal of the substitution to the Architect/Engineer. Approval by the Architect/Engineer of equipment other than the specified does NOT relieve Contractor of this responsibility.
- B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.
- C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment/electrical or accessories into the system, including but not limited to, coordination with other trades and any required changes by other trades and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

1.07 GUARANTEE

- A. Refer to Division 1 for Guarantees and Warranties. In addition to the requirements in Division 1, this Contractor shall meet the following requirements.

- B. In entering into a contract covering this work, the contractor accepts the specifications and guarantees that the work will be carried out in accordance with the requirements of this specification or such modifications as may be made under the contract documents.
- C. Contractor further guarantees that the workmanship and material will be of the best procurable and that none but experienced workmen familiar with each particular class of work will be employed.
- D. Contractor further guarantees to replace and make good at his own expense, including travel time, all defects, which may develop within 1 year after final payment and acceptance by the Architect/Engineer, due to faulty workmanship or material, upon, receipt of written notification from the Owner.

1.08 WORK BY OWNER

- A. None.

1.09 EQUIPMENT FURNISHED BY OTHERS

- A. None.

1.10 PROVISIONS FOR FUTURE

- A. None.

1.11 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 1 for all operations and maintenance instructions.
- B. In addition to the general content specified under Division 1 supply the following additional documentation:
 - 1. Copies of all approved shop drawings along with approval letters.
 - 2. Manufacturer's wiring diagrams for electrically powered equipment
 - 3. Records of tests performed to certify compliance with system requirements
 - 4. Certificates of inspection by regulatory agencies
 - 5. Temperature control record drawings and control sequences
 - 6. Parts lists for manufactured equipment
 - 7. Lubrication instructions, including list/frequency of lubrication done during construction
 - 8. Warranties
 - 9. Additional information as indicated in the technical specification sections

1.12 RECORD DOCUMENTS

- A. Refer to Division 1 for record documents.
- B. In addition to the general content specified under Division 1, follow the following procedures.
 - 1. During the progress of the work, Contractor shall maintain a current (daily) record set of the drawings and specifications, indicating thereon all work installed at variance with such Contract Documents including, without limitation, work covered by Addenda, Field Work Orders, Change Orders and Engineers additional instructions, interpretations and clarification. All changes or deviations from the original layout of the work and all critical dimensions of buried or concealed work shall be recorded. It shall be Contractor's responsibility to assure that said record sets are complete, accurate and up-to-date, Engineer shall have the right to inspect and review such record sets.
 - 2. At the completion of the work, Contractor shall indicated on record sets all record changes and such additional details necessary or appropriate to provide a complete reference document for use by Engineer. If variations and details cannot be shown clearly thereon, the Contractor shall prepare supplemental drawings adequate to impart the information. The foregoing drawings collectively shall constitute the "Record" drawings for the work.
 - 3. All indication on "Record" drawings shall be executed in a legible manner at Contractor's cost, using methods and legend presentations compatible with the overall scheme of the record drawings with respect to scale, drawing sheet sizes and sequential indexing. All changes shall be marked clearly in red and clouded.
 - 4. Engineer may review Contractor's "Record" drawings and notify Contractor of observed discrepancies or deviations. Contractor shall promptly correct discrepancies, deviations or illegible markups at Contractor's expense and resubmit revised drawings for Engineer review.

- C. In addition to the data indicated in the Division 1, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.13 CONTINUITY OF EXISTING SERVICES

- A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.
- B. Each Contractor shall thoroughly familiarize himself with existing systems which will affect and be affected by relocation of existing equipment and installation of new lines and equipment. They shall plan installation of their work so that interruptions of services to any building or portion thereof will be a minimum and such interruptions shall occur only when system is not required, if possible. If not possible, each Contractor shall insure the operation of services by whatever means possible, such as, installing bypasses, capping of services or providing temporary service. Each interruption shall be for as short a duration as possible.
- C. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- D. This Contractor shall restore any circuit interruption as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven day week schedule.

1.14 PROTECTION OF FINISHED SURFACES

- A. Refer to Division 1 for protection of finished surfaces.
- B. Furnish one aerosol spray can of touch-up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" per Division 1.

1.15 SEALING AND FIRESTOPPING

- A. Sealing, fireproofing patching, fire caulking and firestopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.
- B. Contractor shall request current life safety drawings from Architect/Owner.

1.16 OFF SITE STORAGE

- A. If payment will be requested for approved offsite stored material, then the Contractor shall complete an "Off-site Storage Agreement" which is available from the Owner. Prior approval by Owner's personnel for offsite storage will be needed. No material will be accepted for offsite storage unless submittals for the material have been approved.

1.17 REGULATORY REQUIREMENTS

- A. Comply with requirements of Wisconsin Administrative Code and local Authority Having Jurisdiction (AHJ) regarding materials and installation.

1.18 CERTIFICATES AND INSPECTIONS

- A. Refer to Division 1 for permits, regulations, utilities and taxes.
- B. Obtain and pay for all required State or local installation inspections except those provided by the Architect/Engineer in accordance with State Code. Deliver originals of these certificates to the Owner. Include copies of the certificates in the Operating and Maintenance Instructions.
- C. Coordinate and provide inspections as required by the Authority Having Jurisdiction over the site.
- D. Where applications are required for procuring services to the Building, prepare and file such application with the utility company. Furnish all information required in connection with the application in the form required by the utility company.

1.19 COORDINATION

- A. Refer to Division 1 for coordination. In addition to the requirements specified under Division 1, the following requirements apply.
- B. It shall be the responsibility of each Contractor to coordinate and consult with each other to determine space requirements and to determine that adequate space for servicing is provided for all equipment whether furnished by the Contractor or others. The General Contractor shall have final decision on all space priority conflicts among Contractors. All space priority conflicts shall be brought to the attention of the Architect/Engineer and Owner's Representative.
- C. Each Contractor shall thoroughly familiarize himself with existing systems which will affect and be affected by relocation of existing equipment and installation of new lines and equipment. They shall plan installation of their work so that interruptions of services to any building or portion thereof will be a minimum, and such interruptions shall occur only when system is not required, if possible. If not possible, each Contractor shall insure the operation of services by whatever means possible, such as, installing bypasses, capping of services, or providing temporary service. Each interruption shall be for as short a duration as possible.
- D. Cooperation among all Contractors shall be required. Any Work that is installed without cooperating or coordinating with other Contractors and is in conflict shall be removed and reinstalled at that particular Contractor's cost. No cost additions to the Project will be considered due to a Contractor's lack of participation in the cooperation and coordination process. The following list of items of Work shall be the priority of order for all Contractors:
 - 1. Structure
 - 2. Recessed light fixtures
 - 3. Gravity-flow systems for sanitary, storm, steam and steam condensate piping
 - 4. Ductwork and appurtenances
 - 5. Electrical and low voltage cable tray
 - 6. Plumbing vent piping
 - 7. HVAC piping
 - 8. Electrical conduit and low voltage conduit
 - 9. Control or conduit
- E. The above list, in descending order, is the precedence assigned the Work items for space priority. Gravity-flow systems have first priority.
- F. Exception: Plumbing lines below or behind plumbing fixtures shall have precedence over all other work. Electrical conduit above or below switchgear, panelboards and control panels shall have precedence over all other work. Do not install any fluid conveying piping over electrical or elevator equipment.
- G. In the case of interconnection of the work of two or more contractors, verify at the site or on shop drawings all dimensions relating to such work. All errors due to the failure to so verify any such dimensions shall be promptly rectified.
- H. Any installed work that is not coordinated and interferes with another contractor's work shall be removed or relocated at the installing contractor's expense.
- I. Prior to start of Construction, the General Contractor shall schedule a meeting with all of the Contractors responsible for the work items listed above. The purpose of the meeting is to introduce the coordination program and to determine its implementation in relation to the progress schedule.
- J. At the initial Coordination Meeting, the Mechanical Contractor / Ventilating Contractor shall provide to the General Contractor outline drawings at 1/4" scale indicating column centerlines, interior partition locations, and ceiling heights. The General Contractor shall verify all information shown on these drawings and relay any changes in the information to the Ventilation Contractor to be reflected on the Drawings. The Ventilating Contractor, with reference and consideration to the Structural, Heating, Electrical, Fire Protection, and Plumbing Drawings, shall draw to scale his proposed installation showing duct sizes, equipment layouts, and dimensions from column lines and from finished floors to bottom of ducts. Ductwork shall be maintained as tightly as possible to the underside of floor slabs and/or beams. For congested areas the Ventilating Contractor shall, in addition, prepare Drawings in section view. During this phase of the program, it shall be the Electrical Contractor's responsibility to furnish the Ventilating Contractor with recessed lighting installation and clearance requirements. This information shall be outlined on the Drawings by the Ventilating Contractor.
- K. The ductwork layouts shall be produced in sequence as mandated by the Project Schedule. The earliest area indicated in the Schedule shall receive the first effort, etc.

- L. When the Ductwork Drawings for the earliest scheduled area have been completed (time limitation as determined at the initial coordination meeting), the Ventilating Contractor shall provide the General Contractor with one set of drawings for each participant in the effort. The General Contractor will distribute the drawings to the participating Contractors for their use in drawing thereon the major components of their proposed installation using the general scheme shown on the Contract Drawings as a guide.
- M. The major components to be indicated include (but are not limited to) the following:
 - 1. Structure
 - 2. Roof drain leaders
 - 3. Above 3" waste piping
 - 4. Sprinkler mains
 - 5. Heating hot water mains
 - 6. Chilled water mains
 - 7. Conveying systems
 - 8. Significant conduit runs
 - 9. Cable trays
 - 10. Contract ceiling heights
 - 11. Soffits
 - 12. Access points
 - 13. Fire wall penetrations
 - 14. Steam and condensate mains
 - 15. Gas, water, and process piping
- N. Information delineated shall be distance from column centerlines, pipe/equipment size, and distance from finished floor to bottom of pipe/equipment and hangers. Included on the Drawings shall be piping layout with hanger locations and hanger point loads. This information shall be developed satisfactorily enough to allow the Structural Engineer to verify the adequacy of the structural system for the projected loads. The hanger locations may have to be moved depending on the structural system review. No hanger shall be fabricated and/or installed until the hanger locations are reviewed and accepted by the Architect/Engineer.
- O. Within a period not to exceed two weeks after distribution of the drawings, the General Contractor will schedule a meeting with the Architect/Engineer and participating Contractors at which time areas of conflict shall be resolved. The drawings shall be overlaid to identify areas of conflict. All parties shall then cooperate in resolving the conflicts. Records of the agreements shall be entered on the Ventilating Contractor's drawings, acknowledged by all participants by signature in space provided for this purpose, and two copies distributed to all involved parties. All coordination drawing preparation and reproduction costs shall be borne by the Ventilating Contractor. The above drawings, review, and coordination process shall be repeated until all areas on the Project have been coordinated.
- P. In the event a Contractor fails to cooperate in the Coordination Program, they shall be held responsible for all costs incurred for adjustments to the work of others made necessary to accommodate the uncooperative Contractor's installations.

1.20 DEMOLITION AND EXISTING REQUIREMENTS

- A. Existing active services: water, ventilation, sanitary waste, sanitary vent, storm electric, and any other building systems when encountered shall be protected against damage. Where existing services are to be abandoned, the services shall be removed back to the point of origin and removed from the site unless otherwise directed by the Owner's Representative.
- B. Submit a "Sequence of Work Schedule" in respect to all temporary and permanent utility and service cutovers after final determination. This schedule shall be submitted for approval to the Owner and Architect/Engineer. The submittal shall designate priority order, service or utility affected, date of cutover, and time of day to start and finish.
- C. Bidders should inspect the site to become familiar with conditions of the site which will affect the Work. Bidders should verify points of connection with utilities, routing of outside piping to include required clearances from any existing structures, or other obstacles.
- D. Extra payment will not be allowed for changes in the Work required because of the successful bidder's failure to make this inspection.

1.21 REQUEST AND CERTIFICATION FOR PAYMENT

- A. Within 10 days after Notice to Proceed, the successful bidder will submit to the Owner's Project Representative in a form prescribed by Division 1, a cost breakdown of the proposed values for work performed which, if approved by the owner, will become the basis for construction progress and monthly payments. The cost breakdown items shall reflect actual work progress stages as closely as feasible.
- B. In addition, if payment is requested for approved off-site stored material, then that material shall be listed as a line item in the request and certification for payment cost breakdown.

1.22 SLEEVES AND OPENINGS

- A. Openings required in new or existing construction that may be necessary for the installation of new work shall be provided by the respective contractor and all patching and repairing shall be done by workmen competent in the trade required, at the expense of the respective contractor. The respective contractor shall be responsible for arranging the work so that minimum cutting will be required. All rubbish and excess materials involved in such cutting shall be promptly removed from the site and disposed of by the contractor. Cutting through the floor or roof systems or load bearing walls shall be done only with the prior written approval of the Architect/Engineer so as to avoid damaging the structural system.

1.23 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the A/E to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.24 DEFINITIONS

- A. The term "provide" includes such labor, methods, materials, equipment and transportation or other facilities required to complete the Contract and the performance of all duties thereby upon the Contractor.

1.25 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of A/E before proceeding.
- C. Tools, materials and equipment shall be confined to areas designated by the Owner's project representative.

1.26 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate Owner's occupancy requirements. During the construction period coordinate schedule and operations with Owner's Construction Representatives.

1.27 SALVAGE MATERIALS

- A. No materials removed from this project shall be reused (except as specifically noted below). All materials removed shall become the property of and shall be disposed of by the Contractor.

1.28 TRAINING

- A. The contractor shall have the following responsibilities:
 - 1. Provide a training plan sixty days before the planned training covering the following elements:
 - a. Equipment
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.).
 - 2. Provide designated owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.

3. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.
 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 6. The controls contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 7. The training sessions shall follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 8. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
 - c. Discussion of relevant health and safety issues and concerns.
 - d. Discussion of warranties and guarantees.
 - e. Common troubleshooting problems and solutions.
 - f. Explanatory information included in the O&M manuals.
 - g. Discussion of any peculiarities of equipment installation or operation.
 - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
 - i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.
 9. The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
- B. Provide a minimum of **8 hours** of instruction.
- C. Provide additional training as specified in other specification sections for specific equipment.

PART 2 - PRODUCTS

2.01 ACCESS PANELS AND DOORS

- A. Plaster Walls And Ceilings:
1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

2.02 IDENTIFICATION

- A. Piping and ductwork labels shall follow owner's labeling and naming standards.
- B. Stencils:
1. Not less than 1 inch high letters/numbers for marking pipe and equipment.
- C. Snap-On Pipe Markers:
1. Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services.
- D. Engraved Name Plates:

1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

2.03 SLEEVES AND OPENINGS

A. General:

1. Pipe sleeves shall be constructed of standard weight ASTM A53 or ASME B36.10 steel with an anchor plate constructed of A36/A36M steel welded to the pipe. The sleeve shall be sized a minimum of 1" larger than piping insulation diameter. The entire assembly shall be hot-dip galvanized after fabrication.
2. Duct sleeves and piping sleeves passing through interior walls shall be constructed of 24 gauge galvanized steel minimum thickness.

2.04 SEALING AND FIRESTOPPING

A. Fire And/Or Smoke Rated Penetrations:

1. Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco.
2. All firestopping systems shall be provided by the same manufacturer.
3. Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon.

4. Product:

- a. Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Owner and the Authority Having Jurisdiction (AHJ).
- b. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.
- c. Contractor shall use firestop putty, caulk sealant, intumescent wrap strips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.
- d. All sealants shall meet the intent of LEED® VOC requirements, <250 g/L VOC contents (less H₂O and exempt solvents).

B. Non-Rated Penetrations:

1. Duct Penetrations:

- a. Annular space between duct (with or without insulation) and the non-rated partition or floor opening shall not be larger than 2". Where existing openings have an annular space larger than 2", the space shall be patched to match existing construction to within 2" around the duct.
- b. Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation. Provide 4" sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.

PART 3 – EXECUTION

3.01 DEMOLITION

- A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the owner to minimize disruption to the existing building occupants.
- B. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the owner. All designated equipment is to be turned over to the owner for their use at a place and time

so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

- C. All contractors requiring the personnel/ material hoist and or temporary construction elevator (i.e. new elevators, temporarily protected) at times other than outlined in the temporary facilities specifications will make arrangements directly with the general contractor. The general contractor is responsible for all coordination and scheduling of the use of any hoisting equipment so the flow of the project is smoothly maintained and all workers have access to the work areas to perform their work and deliver material to the areas needed according to the project schedule.
- D. If any contractor's work requires the removal and replacement of any finished materials including but not limited to such materials as ceiling tiles, wall finishes, cabinets, doors, flooring, windows, etc. after those items are installed, each contractor will be responsible, at no additional cost to the owner, to replace any damaged, soiled or lost materials with new materials to match the existing materials and those materials damaged.

3.02 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated mechanical systems installation in accordance with Division 31. Blasting will not be allowed without written permission of the Architect/Engineer and the owner.

3.03 CONCRETE WORK

- A. All cast-in-place concrete will be performed by the Division 3 Contractor unless otherwise noted. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support of mechanical equipment.

3.04 CUTTING AND PATCHING

- A. Refer to Division 1 for cutting and patching. In addition to the requirements in Division 1:
- B. Each Contractor shall coordinate the placing of openings in the new structure as required for the installation of each Contractor's work.
- C. Each Contractor shall furnish to the General Contractor the accurate locations and sizes for required openings in the new work, but this shall not relieve each Contractor of the responsibility of checking to assure that properly sized openings are provided. When additional patching is required due to the Contractor's failure to inspect this work, then the Contractor shall make arrangements for the patching required to properly close the openings to include patch painting, and the Contractor shall pay any additional cost incurred in this respect.
- D. If cutting and patching of the new structure is made necessary due to the Contractor's failure to install piping, ducts, sleeves, or equipment on schedule, or due to the Contractor's failure to furnish on schedule the information required for the leaving of openings, then it shall be the Contractor's responsibility to make arrangements and obtain approval from the General Contractor and Architect/Engineer for this cutting and patching, and the Contractor shall pay any additional cost incurred in this respect. The Contractor shall also reimburse the Owner for any additional costs incurred to the Architect/Engineer for additional services caused by the Contractor in this respect.
- E. The Contractor shall provide cutting and patching and patch painting in the existing structure as required for the installation of his Work and shall furnish lintels and supports as required for openings. Cutting of structural support members will not be permitted without prior approval of the Architect/Engineer. Extent of cutting shall be minimized; use core drills, power saws, or other machines which will provide neat, minimum openings. Patching shall match adjacent materials and surfaces and shall be performed by craftsmen skilled in the respective craft required.

3.05 LINTELS

- A. All steel lintels required for opening in existing and/or new masonry walls shall be provided under section 05 50 00 – Metal Fabrications. This contractor shall design, fabricate, and install all lintels required in masonry walls for duct and pipe penetrations. Contractor shall submit design drawings of lintels with professional engineers seal and signature prior to installation.

3.06 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.07 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.
- B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

3.08 COORDINATION

- A. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.
- B. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- C. Cooperate with the test and balance agency in ensuring compliance with Section 23 05 93 – Testing, Adjusting and Balancing for HVAC. Verify system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, duct and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work.

3.09 IDENTIFICATION

- A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.
- B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.
- C. Use engraved name plates to identify control equipment.
- D. Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, "SMOKE DAMPER" or "FIRE DAMPER". Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

3.10 LUBRICATION

- A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.11 SLEEVES AND OPENINGS

- A. General:
 - 1. Sleeves are not required for piping and ducts passing through interior non-rated drywall, plaster, or wood partitions and interior poured concrete walls that have been saw cut or core drilled.
 - 2. Pack annular space between sleeves and pipe or ducts with fiberglass insulation and seal.
 - 3. Refer to Division 1 for additional information on sleeves and openings.

- B. Sleeves Through Floors/Ceilings:
 - 1. Sleeves shall be installed to extend 1 inch above finished floor with a watertight sealant between floor and sleeve in all mechanical rooms and wet rooms listed below.
 - 2. If a sleeve is not provided, provide 1-1/2 inch angle ring with urethane caulk between the angle and the floor and seal at the corners to form a watertight seal.
 - a. Wet Locations:
 - 1) Mechanical Rooms

3.12 SEALING AND FIRESTOPPING

- A. The Contractor shall refer to building life safety drawings for all smoke and fire rates in addition to the mechanical drawings. Any discrepancies shall be brought to the attention of the Architect/Engineer before final addendum.
- B. Fire And/Or Smoke Rated Penetrations:
 - 1. Install approved product in accordance with the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.
 - 2. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.
- C. Non-Rated Partitions:
 - 1. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.
 - 2. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.
 - 3. Duct penetrations through non-rated partitions shall require sheet metal escutcheons with fiberglass or mineral wool insulation fill for spaces that include laboratories, clean rooms, animal rooms, kitchens, cart wash rooms, janitor closets, toilet rooms, mechanical rooms, conference rooms, private consultation rooms, and where noted on drawings elsewhere.

3.13 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION

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**SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

PART 1 – GENERAL

1.01 SCOPE OF WORK

Contractor provide: Premium efficiency motors for air handling units and fans as specified herein and shown on the drawings.

1.02 SECTION INCLUDES

- A. Section includes general requirements for single-phase and poly-phase general purpose squirrel-cage induction motors for use on AC powers systems up to 600 Volts. Included are the following sections:
 - 1. Single Phase Motors

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 23 34 00 – HVAC Fans
- C. Section 23 82 00 – Heating and Cooling Terminal Units

1.04 REFERENCE STANDARDS

- A. The following Standards are referenced herein. Utilize the current edition of the referenced Standards unless otherwise noted:
 - 1. ANSI/IEEE 112 Test Procedure for Polyphase Induction Motors and Generators.
 - 2. ANSI/IEEE 841 Standard for Petroleum and Chemical Industry-Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors-Up to and Including 500 hp.
 - 3. ANSI/NEMA MG-1 Motors and Generators
 - 4. ANSI/NFPA 70 National Electric Code

1.05 COORDINATION

- A. Coordinate features of motors, installed units and accessory devices to be compatible with:
 - 1. Motor controllers.
 - 2. Torque, speed and horsepower requirements of the load.
 - 3. Rating and characteristics of the supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of the installation location.
- B. All starters, overload relay heater coils, disconnect switches, fuses, relays, power wiring, power wiring conduit, push buttons, pilot lights and other devices for the control of motors or electrical equipment are furnished and installed by the Division 26 Contractor unless otherwise noted elsewhere in this Division of Specifications.

PART 2 – PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

- A. Comply with the requirements of this Section unless stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with ANSI/NEMA MG-1 requirements unless otherwise noted.
- C. Comply with ANSI/IEEE 841 requirements for all severe-duty motors unless otherwise noted.

2.02 MOTOR CHARACTERISTICS

- A. Motors shall be continuous duty at ambient temperature of 40°C and an altitude of 3,300 feet above sea level.
- B. Capacity and torque characteristics shall be suitable to start, accelerate and operate the connected loads at the designated speeds, as the installed altitude and environment with the indicated operating sequence without exceeding the nameplate ratings or considering the service factor of the motor.

- C. Perform dynamic balancing and test motors after manufacture. Self-excited vibration velocity of motors shall not exceed limits set forth in NEMA MG-1, Part 7.
- D. Motors shall be standard, off the shelf, readily available for replacement. Special or customize motors will not be acceptable unless pre-bid approved.

2.03 SINGLE PHASE MOTORS

- A. Motors 1/20 horsepower and smaller shall be shaded-pole type.
- B. Motors larger than 1/20 horsepower through 1/3 horsepower shall be one of the following to suit the starting torque and other requirements of the specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Capacitor start, capacitor run.
- C. Multi-speed motors shall be variable torque, permanent-split capacitor type.
- D. Bearings shall be pre-lubricated, anti-friction ball bearing or sleeve bearing type suitable for radial and thrust loading.
- E. Thermal protection shall be internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Thermal-protection device shall automatically reset when the motor temperature returns to a normal range.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Mount motors on a rigid base designed to accept a motor, using metal shims as required under each mounting foot to obtain a secure installation.
- B. Inspect and align each motor when direct coupled to the driven device. Alignment shall be within HVAC equipment manufacturer's limits.
- C. Perform dynamic balancing and test motors for vibration after manufacture. Self-excited vibration velocity of motors shall not exceed 0.157/0.06 inches per second at bearing caps.
- D. Inspect and align each motor when flexible coupled to the driven device. Use a dial indicator to check angular misalignment of the two shafts. Adjust the motor position as required so that the angular misalignment of the shafts does not exceed 0.002" per inch diameter of the coupling hub or the HVAC equipment manufacturer's limits, whichever is more stringent. Use a dial indicator to check the shaft for run-out to assure concentricity of the shafts. Adjust as required so that run-out does not exceed 0.002" per inch diameter of the coupling hub or the HVAC equipment manufacturer's limits, whichever is more stringent.
- E. Inspect and align each motor when connected to the driven device by means of a belt drive. Mount motor sheaves on the appropriate shafts as recommended by the equipment and motor manufacturers. Use a straight edge to check alignment of the sheaves. Reposition the sheaves as required to obtain the proper alignment. After the sheaves are aligned, adjust the motor base as required so that the belt(s) can be added and then tighten the motor base so that the belt tension is in accordance with the drive manufacturers recommendations. Frequently check the belt tension during the first 24 hours of operation and again after 80 hours of operation for proper belt tension. Adjust belt tension as required.

3.02 START-UP

- A. Test start each motor to verify proper rotation prior to operating system.
- B. Lubricate all motors as recommended by motor manufacturer. Record lubrication material used and frequency of use. Include this lubrication log in the Operation and Maintenance manuals.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Base Bid:
 - 1. Contractor provide vibration isolators and flexible connections for the following equipment specified and indicated on the drawings:
 - a. Fans
 - b. Ductwork

1.02 SECTION INCLUDES

- A. This section includes specifications for vibration isolation material for equipment, piping systems, and duct systems. Included are the following topics:
 - 1. Type C: Unhoused Spring with Neoprene
 - 2. Type E: Spring Hanger with Neoprene
 - 3. Type G: Spring Hanger with Neoprene

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Division 3 – Concrete
- C. Section 23 05 00 – Common Work Results for HVAC
- D. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
- E. Section 23 34 00 – HVAC Fans
- F. Section 23 33 00 – Air Duct Accessories

1.04 SUBMITTALS

- A. Refer to Division 1, General Conditions, Submittals. At a minimum, provide submittals for the following items:
 - 1. Type C: Unhoused Spring with Neoprene
 - 2. Type E: Spring Hanger with Neoprene
 - 3. Type G: Spring Hanger with Neoprene
- B. Include isolator type, materials of construction, isolator free and operating heights, and isolation efficiency based on the lowest operating speed of the equipment supported.

1.05 QUALITY ASSURANCE

- A. Refer to Division 1 for equals and substitutions.

1.06 DESIGN CRITERIA

- A. Isolate all motor driven mechanical equipment from the building structure and from the systems which they serve to prevent equipment vibrations from being transmitted to the structure. Consider equipment weight distribution to provide uniform isolator deflections.
- B. For equipment with variable speed capability, select vibration isolation devices based on the lowest speed.
- C. Credit will not be given for flexibility and vibration absorption characteristics of mechanical grooved pipe connections.
- D. Coordinate the selection of devices with the isolator and equipment manufacturers. All isolation material used by contractor shall be supplied by one manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Use materials that will retain their isolation characteristics for the life of the equipment served. Use industrial grade neoprene for elastomeric materials.
- B. Treat all isolators to resist corrosion. For isolation devices exposed to the weather or used in high humidity areas, hot dip galvanize steel parts, apply a neoprene coating on all steel parts, or use stainless steel parts; include limit stops to resist wind.
- C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.
- D. Use isolators with a ratio of lateral to vertical stiffness not less than 1.0 or greater than 2.0.

2.02 VIBRATION ISOLATOR MANUFACTURERS

- A. Mason Industries, Amber/Booth Co., Vibration Mounting & Controls, Peabody Noise Control.

2.03 TYPE C: UNHOUSED SPRING WITH NEOPRENE

- A. Combination freestanding, unhooused spring and neoprene with rib molded antifriction base. Include leveling bolts for securing to the equipment. Springs to be laterally stable under load and selected so they have an additional travel to solid equal to 50% of the rated deflection. Use height saving brackets when appropriate to the application.

2.04 TYPE E: SPRING HANGER WITH NEOPRENE

- A. Vibration hanger with a steel spring and 0.3" deflection neoprene element in series. Use neoprene element molded with a rod isolation bushing that passes through the hanger box. Select spring diameters and size hanger box lower holes large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Select springs so they have a minimum additional travel to solid equal to 50% of the rated deflection.

2.05 TYPE G: SPRING HANGER WITH NEOPRENE

- A. Steel spring hanger located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. Neoprene cup to contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Design spring diameter and size hanger box lower hole sufficiently large to permit the hanger rod to swing through a 30° arc before contacting the hole perimeter and short circuiting the spring. Select spring so it has a minimum additional travel to solid equal to 50% of the rated deflection. Provide hanger with an eye bolt on the spring end and provision to attach the housing to the flat iron duct straps.

PERFORMANCE

- A. Select vibration isolation devices as indicated below or to provide not less than 95% isolation efficiency, whichever is greater.

TYPE OF EQUIPMENT	----- Floor Span or Column Spacing-----							
	--On Grade--		---20 Feet---		---30 Feet---		---40 Feet---	
	Min.		Min.		Min.		Min.	
	Iso.	Defl.	Iso.	Defl.	Iso.	Defl.	Iso.	Defl.
Type	In.	Type	In.	Type	In.	Type	In.	

Centrifugal Blowers:

Suspended: Use Type E-T hangers with deflection from blower minimum deflection guide. Type T needed only when air thrust exceeds 10% of equipment weight.

Floor mounted: Use Type C-IB mount with deflection from blower minimum deflection guide.

DUCTWORK IN MECHANICAL EQUIPMENT ROOMS:

Use Type G hanger with .75" minimum deflection for all ducts with a cross sectional area greater than 2.0 square feet and, where either the air velocity is great than 3500 fpm or, the pressure class is 4" water column or higher.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install seismic and vibration isolation devices in accordance with the manufacturer's installation instructions. The isolation manufacturer and the manufacturer's authorized representative shall be responsible for:
 - 1. Selection of the proper size and type of isolation materials.
 - 2. Preparation of the submittal material required.
 - 3. Field inspection of the installation and, if, necessary, accompanying the Architect/Engineer on a field inspection of the installation.
 - 4. Written certification that the isolation is installed and operating as designed.
- B. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accord with weight distribution of the isolated equipment to provide reasonably uniform deflection. Deflections shall be provided by the equipment manufacturer.
- C. Bolt isolators to equipment and to supporting structure where isolator bolt holes are supplied.
- D. Shim or adjust leveling screws to level equipment. Shims shall not interfere with isolator action.
- E. Verify actual deflected height with design operating height and replace the isolator when they differ by 25% or more.
- F. Correct interferences with the isolator action or report to the Architect/Engineer when interference is caused by another contractor.
- G. Do not allow installation practices to short circuit any isolation device.

3.02 ISOLATION DEVICES OUTDOORS OR IN HIGH HUMIDITY AREAS

- A. Use only hot dip galvanized, stainless steel, or neoprene coated steel parts.

END OF SECTION

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SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor provide:
 - 1. The balancing will be performed by a subcontractor retained by the Mechanical Contractor.

1.02 SECTION INCLUDES

- A. This section includes air and water testing, adjusting and balancing for the entire project. Included are the following topics:
 - 1. Performing Testing, Adjusting and Balancing

1.03 RELATED WORK

- A. Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 09 14 – Pneumatic and Electric Instrumentation and Control Devices for HVAC

1.04 SUBMITTALS

- A. Refer to Division 1 for submittals. At a minimum, provide submittals for the following items:
 - 1. Testing, Adjusting and Balancing Report
- B. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The reports certify that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.
- C. Submission: Distribute electronic copies of the Report to the Contractor, the Project Coordinator, Architect/Engineer, and the owner.
- D. Format: Cover page identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions:
 - 1. General Information
 - 2. Summary
 - 3. Air Systems
- E. Contents: Provide the following minimum information, forms and data:
 - 1. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
 - 2. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.
 - 3. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.
 - 4. Instruments:
 - a. Air balance instruments - Ranges shown are guides. Actual ranges used are subject to Architect/Engineer approval
 - b. Velometer with probes and Pitot tube.
 - c. Rotating vane anemometer.
 - d. ASHRAE Standard Pitot tubes, stainless steel 5/16 outside diameter, lengths 18” and 36”.

- e. Magnehelic Differential Air Pressure Gauges, 0 to 0.5", 0 to 1.0" and 0 to 5.0" water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
 - f. Combination inclined-vertical portable manometer, range 0 to 5.0" water.
 - g. Portable type hook gage, range 0 to 12" water.
 - h. Portable flexible U-tube manometer, magnetic mounting clips, range 0 to 18" water.
 - i. Conical or pyramidal shaped hood.
5. System performance measuring instruments:
- a. Insertion thermometers, with graduations at 0.5° F.
 - b. Sling Psychrometer.
 - c. Tachometer, Centrifugal Type
 - d. Revolution Counter
 - e. Clamp-On Volt-Ammeter
 - f. Recorders, Portable Type for temperature and humidity.

1.05 REFERENCE STANDARDS

- A. AABC National Standards for Total System Balance, Sixth Edition, 2002.
- B. ASHRAE ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.
- C. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of 3 years. A Firm not engaged in the commerce of furnishing or providing equipment or material generally related to HVAC work other than that specifically related to installing Testing and Balancing components necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.
 - 2. A certified member of AABC or certified by NEBB in the specific area of work performed. Maintain certification for the entire duration of the project. If certification of firm or any staff performing work is terminated or expires during the duration of the project, contact owner immediately.
 - 3. Technicians on this project must have satisfactorily completed work on a minimum of (3) three projects of at least 50% in size, and of similar complexity. Size is defined as the quantity of each specific individual item requiring testing and balancing such as, but not limited to, equipment, devices, terminal devices, and grilles and diffusers.
 - 4. Submit Qualifications of firm and project staff to the owner upon request.

1.07 DESCRIPTION

- A. The Contractor will separately contract with an independent test and balance agency to perform all testing, adjusting, and balancing of air and hydronic systems required for this project. Work related to the testing, adjusting, and balancing that must be performed by the installing mechanical contractor is specified in other section of these specifications.
- B. Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings, electrical measurement and verification of performance of all mechanical equipment, all in accordance with standards published by AABC or NEBB.
- C. Test, adjust and balance all air systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.
- D. Verify that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

PART 2 – PRODUCTS

2.01 INSTRUMENTATION

- A. Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB or AABC Standards and instrument manufacturer's specifications.
- B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination by owner upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB or AABC Standards.
- C. Air balance instruments - Ranges shown are guides. Actual ranges used are subject to Architect/Engineer approval.
 - 1. Velometer with probes and Pitot tube.
 - 2. Rotating vane anemometer.
 - 3. ASHRAE Standard Pitot tubes, stainless steel 5/16 outside diameter, lengths 18" and 36".
 - 4. Magnehelic Differential Air Pressure Gauges, 0 to 0.5", 0 to 1.0" and 0 to 5.0" water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
 - 5. Combination inclined-vertical portable manometer, range 0 to 5.0" water.
 - 6. Portable type hook gage, range 0 to 12" water.
 - 7. Portable flexible U-tube manometer, magnetic mounting clips, range 0 to 18" water.
 - 8. Conical or pyramidal shaped hood.
- D. System performance measuring instruments:
 - 1. Insertion thermometers, with graduations at 0.5oF.
 - 2. Sling Psychrometer.
 - 3. Tachometer, Centrifugal Type
 - 4. Revolution Counter
 - 5. Clamp-On Volt-Ammeter
 - 6. Recorders, Portable Type for temperature and humidity.

PART 3 – EXECUTION

3.01 DAILY REPORTS

- A. Submit to owner daily work activity reports for each day on which testing and balancing work is performed. Reports shall include description of day's activities and description of any system deficiencies.

3.02 PRELIMINARY PROCEDURES

- A. Review preconstruction meeting report, applicable construction bulletins, applicable change orders and approved shop drawings of equipment, outlets/inlets and temperature controls.
- B. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals. Inspect all systems components for proper installation and operation. Use manufacturer's ratings for all equipment to make calculations except where field test shows ratings to be impractical. Verify that all instruments are accurately calibrated and maintained.
- C. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation.
- D. Notify owner on a daily basis during balancing. Identify deficiencies preventing completion of testing, adjusting and balancing procedures. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.03 PERFORMING TESTING, ADJUSTING AND BALANCING

- A. Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.
- B. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.
- C. In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

- D. Measure and record system measurements at the fan and/or pump to determine total flow. Adjust equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required for final terminal balancing. Test and record motor full load amperes and current draw. Test and record system static pressure suction and discharge. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.
- E. Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units.
- F. Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and record both sets of data.
- G. Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed system.
- H. Provide fan and motor drive sheave adjustments necessary to obtain design performance. Provide drive changes specifically noted on drawings, if any. If work of this section indicates that any drive or motor is inadequate for the application, advise the engineer by giving the engineer properly sized motor/drive information (in accordance with manufacturers original service factor and installed motor horsepower requirements); Confirm any change will keep the duct/piping system within its design limitations with respect to speed of the device and pressure classification of the distribution system.
- I. Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.
- J. Final air system measurements to be within the following range of specified cfm:

1. Fans	0% to +10%
2. Supply grilles, registers, diffusers	0% to +10%
3. Return/exhaust grilles, registers	0% to -10%
4. Room pressurization air	-5% to +5%
- K. Contact the temperature control contractor for assistance in operation and adjustment of controls during testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.
- L. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.
- M. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.04 DEFICIENCIES

- A. Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. Test and balance agency will notify the owner and engineer of these items and instructions will be issued to the Division 23 00 00 contractor for correction of the deficient work. All corrective work to be done at no cost to the owner. Retest mechanical systems, equipment, and devices once corrective work is complete as specified.

END OF SECTION

SECTION 23 09 14
PNEUMATIC AND ELECTRIC INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes pneumatic control system specifications for all HVAC work as well as related pneumatic control for systems found in other specification sections. Included are the following topics:
 - 1. Control Dampers
 - 2. Power Supplies

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC - Coordination
- D. Section 23 09 93 – Sequence of Operations for HVAC Controls
- E. Section 23 31 00 – HVAC Ducts
- F. Section 23 33 00 – Ductwork Accessories - for control damper installation
- G. Division 23 - HVAC - Equipment provided to be controlled or monitored
- H. Division 26 – Electrical – Installation requirements & Equipment provided to be controlled or monitored

1.04 SUBMITTALS

- A. Refer Section 23 05 00 – Common Work Results for HVAC, Submittals. In addition to the general content specified under Section 23 05 00 – Common Work Results for HVAC, supply the following submittals:
 - 1. Control Dampers
 - 2. Power Supplies
- B. Include the following information:
 - 1. Manufacturer's data sheets indicating model number, pressure/temperature ratings, capacity, methods and materials of construction, installation instructions, and recommended maintenance. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked.
 - 2. Schematic flow diagrams of systems showing fans, pumps, coils, dampers, valves, and other control devices. Label each device with setting or adjustable range of control. Indicate all wiring, clearly, differentiating between factory and field installed wiring. Wiring should be shown in schematics that detail contact states, relay references, etc. Diagrammatic representations of devices alone are not acceptable.
 - 3. Details of construction, layout, and location of each temperature control panel within the building, including instruments location in panel and labeling. Also include on drawings location of mechanical equipment controlled (room number), horsepower and flow of motorized equipment (when this data is available on plans), locations of all remote sensors and control devices (either by room number or column lines).
 - 4. Schedule of control dampers indicating size, leakage rating, arrangement, pressure drop at design airflow, and number and size of operators required.
 - 5. A complete description of each control sequence for equipment that is not controlled by direct digital controls.
- C. Prior to request for final payment, submit record documents which accurately record actual location of control components including panels, thermostats, wiring, and sensors. Incorporate changes required during installation and start-up.

1.05 REFERENCE STANDARDS

- A. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
- B. ANSI/ASTM B32 Specification for Solder Metal
- C. ASTM B75 Seamless Copper Tube
- D. ASTM D1693 Environmental Stress-Cracking of Ethylene Plastics
- E. ASTM D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- F. UL 94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
- G. AMCA 500-D Laboratory Method of Testing Dampers for Rating
- H. ASHRAE Guideline 16-2010 Selecting Outdoor, Return and Relief Dampers for Air-Side Economizer Systems

1.06 QUALITY ASSURANCE

- A. Manufacturers: Installing contractor must be a manufacturer's branch office or an authorized representative of a Direct Digital Control (DDC) equipment manufacturer that provides engineering and commissioning of the DDC equipment. Submit written confirmation of such authorization from the manufacturer. Indicate in letter of authorization that installing contractor has successfully completed all necessary training required for engineering, installation, and commissioning of equipment and systems and that such authorization has been in effect for a period of not less than three years. DDC equipment may or may not be required to be installed by this contractor as part of the project, but the intent of this quality assurance specification is to ensure that the installing contractor has the capabilities to engineer, install, and commission the field devices supplied under this section for temperature control.

1.07 DESIGN CRITERIA

- A. Size all control apparatus to properly supply and/or operate and control the apparatus served. For example damper and valve actuators shall have sufficient power to operate their respective valve or damper from 0 to 100% under load smoothly, without jerking or hysteresis.
- B. Provide control devices subject to corrosive environments with corrosion protection or construct them so they are suitable for use in such an environment.
- C. Provide devices exposed to outside ambient conditions with weather protection or construct them so they are suitable for outdoor installation.
- D. Use only UL labeled products that comply with NEMA Standards. Electrical components and installation to meet all requirements of the electrical sections (Division 26) of project specifications.

1.08 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 23 05 00 – Common Work Results for HVAC.
- B. In addition to the general content specified Section 23 05 00 – Common Work Results for HVAC, supply the following additional documentation:
 - 1. Lubrication instructions, including list/frequency of lubrication
 - 2. List indicating types and grades of oil and/or grease, packing materials, normal and abnormal tolerances for devices, and method of equipment adjustment
 - 3. Table noting full load power factor, service factor, NEMA design designation, insulation class and frame type for each motor provided
 - 4. A complete set of record drawings

1.09 DELIVERY, STORAGE AND HANDLING

- A. Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

1.10 SYSTEM DESCRIPTION

- A. Control damper and exhaust fan to be tied into Lighting Control Panel.

1.11 DEMOLITION

- A. Where existing control devices, piping, or wiring are discontinued from use, remove and turn over to owner. If owner does not want them remove from premises. Remove any previously abandoned control devices in a similar manner.

PART 2 – PRODUCTS

2.01 CONTROL DAMPERS

- A. Provide control dampers shown on the plans and as required to perform the specified functions. Dampers shall be rated for velocities that will be encountered at maximum system design and rated for pressure equal to or greater than the ductwork pressure class of the ductwork where the damper is installed, as specified in Section 23 31 00 – HVAC Ducts and Casings.
- B. Use only factory fabricated dampers with mechanically captured replaceable resilient blade seals, stainless steel jamb seals and with entire assembly suitable for the maximum temperature and air velocities encountered in the system.
- C. All dampers in aluminum ductwork shall be constructed of stainless steel or aluminum.
- D. Dampers in galvanized ductwork shall be constructed of galvanized steel and/or aluminum.
- E. All dampers, unless otherwise specified, to be rated at a minimum of 180° F working temperature. Leakage testing shall be certified to be based on latest edition of AMCA Standard 500-D and all dampers, unless otherwise specified, shall have leakage ratings as follows:

Damper Class	Differential Pressure	Leakage
Class IA	1” w.g.	≤3 CFM/ft ²
Class I	4” w.g.	≤8 CFM/ft ²
- F. Leakage rate dampers for differential pressures that they will encounter at maximum system design pressures.
- G. Steel framed dampers: Nailor models 2010 & 2020; Greenheck models VCD-33 & VCD-42; Johnson Controls model V-1330; Ruskin Models CD60 & CD40.
- H. Aluminum frame and blade dampers: Nailor models 2010EAF & 202EAF; Greenheck model VCD-43; Ruskin model CD50; Arrow model AFD-20.
- I. Dampers used for isolation on the discharge of centrifugal fans shall have damper blades perpendicular to the fan shaft to minimize system effect. Dampers mounted with blades vertically shall be designed for vertical blade orientation.
- J. Dampers for applications to have frames of not less than 16 gauge galvanized steel or 12 gauge extruded aluminum. Blades to be two-ply steel airfoil of not less than 2 x 20 gauge galvanized steel (14 gauge equivalent) or extruded aluminum airfoil, with stainless steel, acetal, Celcon, bronze, or nylon bearings. Maximum allowable blade width is 8 inches. Use plated steel linkage hardware.
- K. Jack shafts shall be extended outside of the ductwork for external actuator mounting. Provide bearings on the point of exit for support of damper shafts to prevent wear on the shaft and the ductwork. If locating actuators out of the air stream is impossible, obtain mounting location approval from the A/E unless the contract documents indicate in air stream mounting is acceptable. In no cases shall damper actuators for fume exhaust systems be located in the air stream or require entering the air stream to service an actuator.
- L. Provide weatherproof NEMA 4 enclosures (Belimo N4 option, Belimo ZS-100 or ZS-150 are not acceptable) that have removable covers that have clasps or machine screws (no sheet metal screws) and that do not require removing fasteners from the ductwork to prevent actuator failure or freeze-up when mounting in locations exposed to harsh environments or outdoor locations.
- M. Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to provide tight shutoff against system temperatures and pressure encountered.
 - 1. For electric modulating actuation, use fully proportional actuators with zero and span adjustments.
 - 2. For terminal unit actuators, stepping motors may be used and zero and span is not required.
 - 3. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be used for hardwire interlocking.
- N. All power required for electric actuation shall be provided by this contractor if it is not able to be directly provided from the controller.
- O. Provide operators with linkages and brackets for mounting on device served.

2.03 POWER SUPPLIES

- A. Provide all required power supplies for transducers, sensors, transmitters and relays. All low voltage transformers shall have a resettable secondary circuit breaker and be listed as class 2 power supplies.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install system with trained mechanics and electricians employed by the control equipment manufacturer or an authorized representative of the manufacturer. Where installing contractor is an authorized representative of the control manufacturer, such authorization shall have been in effect for a period of no less than three years.
- B. Install all control equipment, accessories, wiring, and piping in a neat and workmanlike manner. All control devices must be installed in accessible locations. This contractor shall verify that all control devices furnished under this Section are functional and operating the mechanical equipment as specified.
- C. Label all control devices with the exception of dampers, valves, and terminal unit devices with permanent printed labels that correspond to control drawings. Temperature control junction and pullboxes shall be identified utilizing spray painted green covers. Other electrical system identification shall follow the Division 26 identification specification requirements.
- D. All control devices and electrical boxes mounted on insulated ductwork shall be mounted over the insulation. Provide mounting stand-offs where necessary for adequate support. Cutting and removal of insulation to mount devices directly on ductwork is not acceptable. This contractor shall coordinate with the insulation contractor to provide for continuous insulation of ductwork.
- E. Mounting of electrical or electronic devices shall be protected from weather if the building is not completely enclosed. This Contractor shall be solely responsible for replacing any equipment that is damaged by water that infiltrates the building if equipment is installed prior to the building being enclosed.
- F. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all high voltage and low voltage wiring (includes low voltage cable) in metal conduit, Electrical Non-metallic Tubing (ENT), or Electrical Metallic Tubing (EMT), as scheduled below and hereafter referred to generically as conduit. See Wire and Air Piping Conduit Installation Schedule below for specific conduit or tubing to be used. All conduit must be installed in accordance with electrical sections (Division 26) of this specification and the National Electrical Code.
- G. Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.
- H. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded.
- I. Low voltage wiring can be run without conduit above accessible lay-in tile ceilings. All wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other locations should be in conduit. Wire for wall sensors must be run in conduit. Wiring for radiation valves shall be run in conduit where routed through walls.
- J. Where wiring is installed free-air, installation shall consider the following:
 - 1. Wiring shall utilize the cable tray wherever possible.
 - 2. Wiring shall run at right angles and be kept clear of other trades work.
 - 3. Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung without being threaded through the ring. For mounting rings that do not completely surround the wire, attach the wire to the mounting ring with a strap.
 - 4. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
 - 5. Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
 - 6. Wall penetrations shall be sleeved.

- K. Wiring shall not be attached to existing cabling, existing tubing, piping, ductwork, ceiling supports or electrical or communications conduit.
- L. Control panels serving equipment fed by emergency power shall also be served by emergency power.
- M. This contractor shall be responsible for all 120VAC power, not provided in the Division 26 specifications, required for equipment provided under this section.
- N. Provide communication trunk wiring to integrated devices (i.e. VFD's, Flow Meters, Chillers, Lighting Panels, Electrical Meters, etc.) that are specified to be connected to the building automation system. Communication trunk wiring shall be as required by the equipment specified under the Section 23 09 23 – Direct Digital Control System for HVAC and shall be routed to the DDC panel designated for that equipment as shown on the plans or the closest DDC panel if not designated. If communication trunks required daisy chained style wiring, provide two communication cables to the DDC panel so that the communication trunk is not dead ended.
- O. Install "hand/off/auto" selector switches on systems where automatic interlock controls are specified and "hand/off/auto" selector switches are not supplied with the equipment controlled. Control panel power will not be required for "hand" switch to operate. When switch is in "hand" position, allow manual operation of the selected device without operating the interlocked motors but allowing all unit safety devices to stay in the circuit.
- P. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

3.02 WIRE AND AIR PIPING CONDUIT AND TUBING INSTALLATION SCHEDULE

- A. Conduit and tubing referenced shall meet specifications in Division 26.
- B. Wet Interior Locations: Rigid steel conduit.
- C. Concealed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.
- D. Exposed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.

3.03 CONTROL DAMPERS

- A. All control dampers furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Temperature Control Contractor in locations shown on plans or where required to provide specified sequence of control.
- B. Coordinate installation with the sheetmetal installer to obtain smooth duct transitions where damper size is different than duct size. Blank off plates will not be accepted. Transitions required to facilitate dampers shall be provided by Mechanical Contractor.
- C. Each operator shall serve a maximum damper area of 36 square feet. Where larger dampers are used, provide multiple operators.
- D. Furnish control dampers as shown on drawings and/or as required to perform control sequences specified, except those furnished with other equipment.

END OF SECTION

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**SECTION 23 09 93
SEQUENCE OF OPERATION FOR HVAC CONTROLS**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete control system in this specification.

1.02 SECTION INCLUDES

- A. This section includes control sequences for HVAC equipment as well as equipment furnished by others that may need monitoring or control. Included are the following topics:
 - 1. General Control Sequence Items
 - 2. Equipment Specific Control Sequences

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC – Coordination
- D. Section 23 09 14 – Electric Instrumentation and Control Devices for HVAC
- E. Division 23 – HVAC - Equipment provided to be controlled or monitored

1.04 SUBMITTALS

- A. Refer to Division 1, Section 23 05 00 – Common Work Results for HVAC, Section 23 09 14 – Pneumatic and Electric Instrumentation and Control Devices for HVAC for descriptions of what should be included in the submittals.

1.05 DESIGN CRITERIA

- A. Reference Section 23 09 14 – Pneumatic and Electric Instrumentation and Control Devices for HVAC.

1.06 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 23 05 00 – Common Work Results for HVAC.

1.07 REFERENCE

- A. For the following work, refer to Section 23 09 14 – Pneumatic and Electric Instrumentation and Control Devices for HVAC.
 - 1. Furnishing and installing all field devices, including electronic sensors for the DDC of this section, equipment, and all related field wiring, interlocking control wiring between equipment, pneumatic tubing, sensor mounting, etc., that is covered in that section.
 - 2. Motorized control dampers and actuators, thermowells (temperature sensing wells), automatic control valves and their actuators.

1.08 DESCRIPTION OF WORK

- A. Refer to drawings for control requirements of exhaust fan and damper, and electric heaters.

PART 2 – PRODUCTS

- 2.01 Not applicable to this section – reference Sections 23 09 14 for product descriptions.

PART 3 – EXECUTION

3.01 CONTROL SEQUENCES

- A. General Control Sequence Items:
1. Setpoints:
 - a. All setpoints indicated in the control specification are to be adjustable. The setpoints shall be readily available to be modified in the mechanical system software system summary (either textual or graphic based) and under the same software level as hardware points. Some less used setpoints may be provided on a lower software level, if requested by the Owner for clarity. The setpoints indicated herein are only specified as a calculated starting point (or initial system operation). It is expected that setpoint adjustments and control loop tuning shall be required to provide optimum system operation based on requirements of the building. The control contractor shall work with the balancing contractor and the Owner to provide the final system setpoint adjustments and control loop tuning after the system is in operation and building is in use. Document all final setpoints on the as-built control drawings. Any questions regarding the intended operation of the HVAC equipment and control systems shall be referred to the HVAC design engineer through the appropriate construction communication process. The following setpoints should be used as initial setpoints unless otherwise specified in the individual control sequences:
 - 1) Mechanical or Unoccupied Space Cooling/Ventilation: 82° F
 - 2) Mechanical or Unoccupied Space Heating: 60° F
- B. Anti-Cycling:
1. When HVAC equipment or a sequence is specified to be started and stopped by a temperature, humidity, pressure setpoint or any other controlled variable, there shall be an adjustable differential setpoint that shall be set to prevent short cycling of the systems and equipment due to minor changes in the controlled variable. Temperature differential setpoints shall be set at 2° F and non-temperature setpoints shall be set at 10% of the controlled range unless otherwise specified. Setpoints shall indicate at when the process should be turned on. Heating and cooling differentials shall be set for above setpoint and will be used to turn the process off. For example, an economizer sequence called to switch at 68° F, would turn on at 68° F and off at 70° F since it is a cooling function. A heating lockout setpoint of 50° F would turn on heating control at 50° F and off at 52° F Non-temperature differentials shall be set above setpoint if the setpoint is indicating a minimum value or below setpoint if the setpoint is indicating a maximum value. Provide minimum runtime timers for loads that are cycled to prevent over-cycling. Timers shall be set as specified or as needed to prevent damage or excessive wear to the equipment. Unless otherwise specified in the individual control sequences, fans and pumps shall have a minimum runtime on timers of 15 minutes (adj.) and off timers of 5 minutes (adj.). Safeties shall override runtime timers.
- C. Deadbands:
1. Provide deadbands for all DDC control loops to prevent constant hunting of output signals to controlled devices. Deadbands shall be set to provide adequate control around setpoint as follows unless otherwise specified in the individual control sequences:
 - a. Temperature Control: $\pm 0.5^{\circ}$ F
 - b. Humidity Control: $\pm 1\%$ RH
 - c. Airflow Control: $\pm 2\%$ of total flow
 - d. AHU Static Pressure Control: ± 0.01 in. w.c.
- D. Alarms: Provide all alarmed points with adjustable time delays to prevent nuisance tripping under normal operation and on equipment start-up. For all commanded outputs that have status feedback, provide an alarm that will indicate the commanded output is not in its commanded state. Provide alarms on all points as indicated on point charts. For existing automations systems, add/delete what is called for on the point charts after consultation with Owner to provide consistent alarming throughout the automation system.
- E. Equipment Start/Stop Failure States: All start/stop points for equipment shall utilize normally open contacts unless called out specifically in the individual control sequences.
- F. Damper Interlocks For Fans With Starters: For fan systems with magnetic starters and shutoff dampers specified with end switches, the damper interlock shall be hardwired in such a way that the damper shall open if the fan starter hand / off / auto switch is in the hand or in the auto position and being called to start. After the damper end switch has proven the damper open, a hardwire interlock from the end switch to the starter holding coil for the fan shall cause the fan to start. For fan systems that are ducted in parallel, see specific sequence for fan system on interlock requirements.

- G. Damper Interlocks For Fans With VFD's:
 - 1. For fan systems with VFD's and shutoff dampers specified with end switches, the damper end switches shall be hardwire interlocked to the safety circuit(s) of the VFD to prevent the fan from starting until the damper is proven open. This interlock shall prevent the fan from running in either the VFD or bypass (if provided) mode. The damper end switch shall also be monitored by the DDC system. For fan systems that are ducted in parallel, see specific sequence for fan system on additional interlock requirements.
 - 2. For fan systems with VFD's and shutoff dampers specified with end switches, hardwire interlock the shutoff damper with the fan VFD. When the fan is remotely or locally commanded to start, VFD contacts shall energize outside air damper actuator to open damper. The damper position end switch shall be wired to run permissive input on the VFD and enable the VFD to start when the damper position end switch provides the damper is open. This operation shall be provided for VFD and bypass operation if the VFD is provided with a bypass. The damper end switch shall also be monitored by the DDC system. For fan systems that are ducted in parallel, see specific sequence for fan system on additional interlock requirements.
- H. Original Equipment Manufacturer (OEM) Controller Ddc Integration:
 - 1. Provide DDC programming to define all equipment integral input/output points, setpoints, data points, calculations, etc. that are available through the manufacturers communication interface. Consult with the Owner DDC operations personnel to determine if some of the points should be omitted (for clarity or lack of value). The following equipment shall be integrated into the DDC system:
 - a. Lighting Control (furnished by Div. 26)
 - I. Weekly Scheduling: Provide scheduling of DDC terminal units in groups based on occupancy. Work with the Owner to determine how many groups are required and which zones should be included. Individual terminal units shall be able to receive temporary schedules that will override the group schedules. Temporary override buttons at the zone sensor (where specified on point charts) shall override the scheduling to occupied. When groups that consist of more than 20% of terminal units are indexed to occupied, the associated air handling unit shall start if not already running.

3.02 EQUIPMENT SPECIFIC CONTROL SEQUENCES

- A. Refer to the project drawings for exhaust fan and damper control sequence requirements.

END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for all duct systems used on this project. Included are the following topics:
 - 1. Low Pressure Ductwork (Maximum 2 inch pressure class)
 - 2. Duct Sealant
 - 3. Gaskets

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- D. Section 23 33 00 – Air Duct Accessories

1.04 SUBMITTALS

- A. Refer to Section 23 05 00 – Common Work Results for HVAC, Submittals. In addition to the general content specified under Section 20 05 00 – Common Work Results for HVAC, supply the following submittals:
 - 1. Low Pressure Ductwork (Maximum 2 inch pressure class)
 - 2. Duct Sealant
 - 3. Gaskets
- B. Include manufacturer's data and/or Contractor data for the following:
 - 1. Fabrication and installation drawings.
 - 2. Schedule of duct systems including material of construction, gauge, pressure class, system class, method of reinforcement, joint construction, fitting construction, and support methods, all with details as appropriate.
 - 3. Duct sealant and gasket material.

1.05 REFERENCE STANDARDS

- A. ANSI SS-EN 485-2 Aluminum and Aluminum Alloys-Sheet, Strip and Plate-Part 2: Mechanical Properties
- B. ASTM B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- C. ASTM A90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
- D. ASTM A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- E. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- F. ASTM 924 Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
- G. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials
- H. ASTM C 1338 Test Method for Determining Fungal Resistance of Insulation Materials and Facings
- I. ASTM G 21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- J. ASTM C 916 Standard Specification for Adhesives for Duct Thermal Insulation NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems
- K. UL 181 Standard for Safety for Factory Made Air Ducts and Air Connectors.

1.06 QUALITY ASSURANCE

- A. Refer to division 1 for equals and substitutions.

1.07 DESIGN CRITERIA

- A. Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.
- B. Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:
 - 1. HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
 - 2. HVAC Systems - Duct Design, 4th Edition, 2006
 - 3. HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
 - 4. Rectangular Industrial Duct Construction Standard, 2nd Edition, 2004
 - 5. Round Industrial Duct Construction Standards, 2nd Edition, 1999

- C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.
- B. Protect Ductwork against damage.
- C. Protect Ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.
- D. Offsite storage agreements do not relieve the contractor from using proper storage techniques.
- E. Storage and protection methods must allow inspection to verify products.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork and spiral duct take-offs 12” and below may be 26 gauge where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005.
- B. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

2.02 DUCTWORK PRESSURE CLASS

- A. Minimum acceptable SMACNA duct pressure class, for all ductwork except transfer ductwork, is 2 inch W.G. positive or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1 inch W.G. positive or negative, depending on the application. Duct system pressure classes not indicated on the drawings to be as follows:

Exhaust duct	3 in. pressure class
Transfer ducts	1 in. pressure class

2.03 MATERIALS

- A. Galvanized Steel Sheet: Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide “Paint Grip” finish or galvanneal sheetmetal for ductwork that will be painted.
- B. Uncoated Black Steel Sheet: First quality, soft steel sheet capable of welding or double seaming without fracture.
- C. Aluminum Sheet: Use ANSI/ASTM B209 aluminum sheet, alloy 3003H-14, capable of double seaming without fracture.
- D. Stainless Steel Sheet: Use ASTM A167, Type 304 or 316 stainless steel sheet as specified, 316L if welded ductwork, with No. 2B finish for concealed work and No. 3 finish for exposed work.

2.04 HIGH PRESSURE DUCTWORK (PRESSURE CLASS 3 INCH AND OVER)

- A. Manufacturers: Ajax, Semco, United Sheet Metal, Sheet Metal Connectors.
- B. Machine formed round and/or flat oval spiral lock seam duct constructed of galvanized steel.
- C. Rectangular high pressure duct using a transverse joint system as manufactured by Ductmate, Nexus, TDC or TDF, may be used at contractor's option. Duct to be flanged, gasketed and sealed.
- D. Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.
- E. Use a perforated inner liner on double wall high-pressure duct. Annular space between inner liner and outer duct to be filled with 1 inch glass fiber insulation.
- F. Use cemented slip joints with 2 inch minimum overlap, flanged connections, or welded/brazed connections, unless noted otherwise for special applications. Prime coat welded joints.
- G. Provide standard 90 degree conical tee takeoffs except for exhaust at velocities over 2000 feet per minute, use 45° lateral connections; straight taps or bullhead tees are not acceptable.
- H. Internal bracing will not be accepted on ductwork below 48 inches.
- I. Use turning vanes as specified in Section 23 33 00 – Air Duct Accessories.
- J. Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.
- K. Provide pressure relief fittings as indicated on the plans and/or details.
- L. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

2.05 LOW PRESSURE DUCTWORK (MAXIMUM 2 INCH PRESSURE CLASS)

- A. Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.
- B. Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction when fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2 inch into the duct.
- C. Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits. When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in accordance with SMACNA publications, Type RE 3. Where space will not allow and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00 – Air Duct Accessories. Square throat-radius heel elbows will not be acceptable. Straight taps or bullhead tees are not acceptable.
- D. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00 – Air Duct Accessories.
- E. Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be accepted.
- F. Button punch snaplock construction will not be accepted on aluminum ductwork.
- G. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer. Substitution of round ducts for rectangular ducts will only be considered if sized in accordance with ASHRAE table of equivalent rectangular and round ducts.
- H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- I. Transverse joints for rectangular ducts shall be in accordance with SMACNA HVAC Duct Construction Standards type T-15 through T-24.
- J. Button punch snap lock (SMACNA L-2) and grooved seams (SMACNA L-3) shall not be used on rectangular duct longitudinal seams.
- K. Longitudinal seams for round ducts shall be lock type spiral seam (SMACNA RL-1) or grooved seam (SMACNA RL-5).
- L. Snaplock seams are acceptable on low pressure round ducts with a diameter of 12" or less.

2.06 DUCT SEALANT

- A. Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peel & Seal, Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal. Silicone sealants are not allowed in any type of ductwork installation.
- B. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.
- C. For plenums installations, use duct sealant with a flame spread index of not more than 25 and smoke-developed index of not more than 50. When tested in accordance with ASTM E84 or UL 723.

2.07 GASKETS

- A. 2 Inch Pressure Class And Lower: Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.
- B. 3 Inch Pressure Class And Higher: Butyl gaskets.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference.
- B. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure ductwork, fume exhaust ductwork or kitchen hood exhaust ductwork.
- C. Test openings for test and balance work will be provided under Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
- D. Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.
- E. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.
- F. Where two different metal ducts meet, the joint shall be installed in such a manner that metal ducts do not contact each other by using proper seal or compound.
- G. Install all motor operated dampers and connect to or install all equipment furnished by others. Blank off all unused portions of louvers, as indicated on the drawings, with 1-1/2 inch board insulation with galvanized sheet metal backing on both sides.

- H. Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.
- I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- J. Provide adequate access to ductwork for cleaning purposes.
- K. Provide temporary capping of ductwork openings on job site, both before and after installation, to prevent entry of dirt, dust and foreign material.
- L. Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the ductwork.
- M. Install prefabricated grease ductwork assemblies in accordance with manufacturer requirements and NFPA 96.
- N. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- O. All ductwork not welded, at a minimum, shall be sealed using duct sealant or gaskets on all seams, joints and penetrations.
- P. Provide 45 degree entry fitting with a minimum throat length of 25% of the width of the branch duct takeoff or 4 inches, whichever is larger.

3.02 DUCTWORK SUPPORT

- A. Support ductwork in accordance with the latest SMACNA HVAC Duct Construction Standards, Figure 5-5, except supporting ductwork with secure wire method is not allowed.
- B. Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching fastener rated for 50% of actual load, will be allowed on round ductwork under 12 inches if installed as detailed, with cable double looped on duct and at point of support.
- C. On ductwork sections exceeding 8', provide at least two supports.

3.03 HIGH PRESSURE DUCT (PRESSURE CLASS 3 INCH AND OVER)

- A. Seal all duct in accordance with SMACNA seal class "A". All seams, joints, and penetrations shall be sealed using duct sealant or gaskets per Part 2 - Products.

3.04 LOW PRESSURE DUCT (MAXIMUM 2 INCH PRESSURE CLASS)

- A. Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal class "A". All seams, joints, and penetrations shall be sealed using duct sealant or gaskets per Part 2 - Products.
- B. Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers will not be accepted for balancing dampers.
- C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at contractor's option.

3.05 CLEANING

- A. Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.
- B. Clean duct systems with high power vacuum machines where systems have been used for temporary heat, air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

3.06 LEAKAGE TEST

- A. If excessive air leakage is found locate leaks, repair the duct in the area of the leak, seal the duct, and retest.
- B. Submit a signed report to the Owner, indicating test apparatus used, results of the leakage test, and any remedial work required to bring duct systems into compliance with specified leakage rates.

3.07 STRUCTURAL TEST

- A. Deflection limits shall not exceed those listed in accordance with Chapter 11 of SMACNA HVAC Duct Construction Standards, 3.0 Performance Requirements.
- B. Submit a signed report to the Owner, indicating test apparatus used, results of the structural test, and any remedial work required.

END OF SECTION

**SECTION 23 33 00
AIR DUCT ACCESSORIES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes accessories used in the installation of duct systems. Included are the following topics:
 - 1. Manual Volume Dampers
 - 2. Turning Vanes
 - 3. Control Dampers
 - 4. Access Doors
 - 5. Flashings
 - 6. Duct Flexible Connections
 - 7. Louvers

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment
- D. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
- E. Section 23 09 93 – Sequence of Operations for HVAC Controls
- F. Section 23 31 00 – HVAC Ducts and Casings

1.04 SUBMITTALS

- A. Refer to Section 23 05 00 – Common Work Results for HVAC, Submittals. In addition to the general content specified under Section 20 05 00 – Common Work Results for HVAC, supply the following submittals:
 - 1. Manual Volume Dampers
 - 2. Turning Vanes
 - 3. Control Dampers
 - 4. Access Doors
 - 5. Flashings
 - 6. Duct Flexible Connections
 - 7. Louvers
- B. Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.
- C. Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance of sound attenuators.
- D. Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

1.05 REFERENCE STANDARDS

- A. NAIMA Fibrous Glass Duct Liner Standard
- B. NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
- C. SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition, 2005
- D. UL 214

1.06 QUALITY ASSURANCE

- A. Refer to Division 1 for equals and substitutions

1.07 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 23 05 00 - Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 MANUAL VOLUME DAMPERS

- A. Manufacturers: Ruskin, Vent Products, Air Balance.
- B. Dampers must be constructed in accordance with SMACNA Fig. 7-4, Fig. 7-5, and notes relating to these figures, except as modified below.
- C. Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

2.02 TURNING VANES

- A. Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley.
- B. Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 4-3 and Fig. 4-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Chart 4-1 and Fig. 4-9.

2.03 CONTROL DAMPERS

- A. Control dampers are specified in section 23 09 14.

2.05 ACCESS DOORS

- A. Access door to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be steel full length continuous piano type. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non-hinged doors provide sufficient number of cam sash latches to provide air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1" deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.
- B. Use insulated 1-1/2 hour UL 1978 listed and labeled access doors in kitchen exhaust ducts.

2.07 FLASHINGS

- A. Provide flashing to completely weatherproof connection of ductwork to louvers. Flashing to be constructed of material similar to louver material.
- B. Flashing and counterflashing for roof curbs will be provided by others.
- C. Flashing and curbs for duct and pipe penetrations of roof assemblies to be in accordance with details.

2.08 DUCT FLEXIBLE CONNECTIONS

- A. Material shall be fire retardant, shall be UL 214 listed, and shall meet the requirements of NFPA 90A.
- B. Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and air tight. Connections to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected equipment, and other movement.
- C. Use coated glass fiber fabric for all applications. Material for inside applications other than corrosive environments, fume exhaust, or kitchen exhaust to be double coated with neoprene, air and water tight, suitable for temperatures between -10°F and 200°F, and have a nominal weight of 30 ounces per square yard. Material used for outdoor applications other than corrosive environments, fume exhaust, or kitchen

exhaust to be double coated with Elastomer, air and water tight, suitable for temperatures between -10°F and 250°F, and have a nominal weight of 26 ounces per square yard.

2.09 LOUVERS

- A. Manufacturers: Vent Products 2600, Airolite K6776, Industrial Louvers 658, American Warming and Ventilating LE-31, Construction Specialties 6177, Ruskin ELF6375DX.
- B. Refer to drawing schedule for additional requirements.

PART 3 – EXECUTION

3.01 MANUAL VOLUME DAMPERS

- A. Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

3.02 TURNING VANES

- A. Install turning vanes in all rectangular, mitered elbows in accordance with the latest SMACNA standards and/or manufacturer's recommendations.
- B. Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.
- C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Chart 4-1 and Fig. 4-9.

3.03 CONTROL DAMPERS

- A. Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's instructions. Install blank-off plates or transitions where required for proper mixing of airstreams in mixing plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent to each control damper for inspection and maintenance.

3.04 ACCESS DOORS

- A. Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and control devices needing periodic maintenance.
- B. Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils.
- C. Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, "SMOKE DAMPER" or "FIRE DAMPER". Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

3.06 FLASHINGS

- A. Flashing for roof curbs, equipment supports or rails located on roof will be installed by others.

3.08 DUCT FLEXIBLE CONNECTIONS

- A. Install at all duct connections to rotating or vibrating equipment, including air handling units (unless unit is internally isolated), fans, or other motorized equipment in accordance with SMACNA Figure 7-10. Install thrust restraints to prevent excess strain on duct flexible connections at fan inlets and outlets; see Related Work.

3.09 LOUVERS

- A. Furnish louvers to the General Contractor for mounting in exterior walls. Connect outside air intake duct to the louver, sealing all connections air and water tight.
- B. Provide bird screen where none is provided with louvers. Where louvers are equipped with inside bird screen, remove screen at all locations where duct connections are not made.
- C. Where ductwork is visible through louver when viewed from outside the building, paint inside of duct to match louver color.

3.10 TRAINING

- A. See Section 23 05 00 – Common Work Results for HVAC for general training requirements.
- B. In addition to the training provided in Section 23 05 00 – Common Work Results for HVAC, provide an additional 1 hours of training for each type of duct accessory provided on the project.

END OF SECTION

SECTION 23 34 00
HVAC FANS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for fans that are not an integral part of a manufactured device. Included are the following topics:
 - 1. Centrifugal Fans
 - 2. In-line Centrifugal Fans

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 13 – Common Motor Requirements for HVAC Equipment
- D. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
- E. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
- F. Section 23 09 93 – Sequence of Operations for HVAC Controls

1.04 SUBMITTALS

- A. Refer to Section 23 05 00 – Common Work Results for HVAC, Submittals. In addition to the general content specified under Section 20 05 00 – Common Work Results for HVAC, supply the following submittals:
 - 1. Centrifugal Fans
 - 2. In-line Centrifugal Fans
- B. Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration isolation for all equipment. Sound power levels to be based on tests performed in accordance with AMCA Standard 300.
- C. Submit color selection charts for equipment where applicable.
- D. Fan curves shall indicate the relationship of CFM to static or total pressure for various fan speeds. Maximum and minimum RPM curves shall be displayed on fan curve. Brake horsepower, recommended selection range, and limits of operation are to also be indicated on the curves. Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's recommended drive loss factor for the specific application. Tabular fan performance data is not acceptable.
- E. For variable air volume application, include data which indicates the effect of capacity control devices, such as inlet vanes, on performance.

1.05 REFERENCE STANDARDS

- A. AMCA 203 AMCA Fan Application Manual - Troubleshooting
- B. AMCA 210 Laboratory Method of Testing Fans for Rating
- C. AMCA 300 Reverberant Room Method for Sound Testing of Fans
- D. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

1.06 QUALITY ASSURANCE

- A. Refer to Division 1 for equals and substitutions.

1.07 DESIGN CRITERIA

- A. Tested and certify all fans in accordance with the applicable AMCA test code.
- B. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.

- C. Consider drive efficiency in motor selection according to manufacturer's published recommendation or according to AMCA Publication 203, Appendix L.
- D. Where inlet and outlet ductwork at any fan is changed from that shown on the drawings, provide any motor, drive and/or wiring changes required due to increased static pressure or baffling necessary to prevent uneven airflow or improve mixing.
- E. All internal insulation and other components exposed to the airstream are to meet the flame spread and smoke ratings contained in NFPA 90A.

1.08 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 23 05 00 – Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Use fan size, class, type, arrangement, and capacity as scheduled.
- B. Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, and accessories required for specified performance and proper operation. All single phase motors to have inherent thermal overload protection.
- C. Provide variable pitch sheaves for drives 3 hp and smaller, fixed pitch sheaves for drives 5 hp and larger. Design all drives for 150% of motor rating.
- D. Use OSHA approved belt guards that totally enclose the entire drive. Construct guards of expanded metal to allow for ventilation; provide tachometer openings at shaft locations.
- E. Statically and dynamically balance all fans so they operate without objectionable noise or vibration.

2.02 CENTRIFUGAL FANS

- A. Manufacturers: PennBarry, Peerless, Buffalo, Carrier, Champion, Chicago Blower, Greenheck, New York Blower, Trane, Twin City.
- B. Construct housing of welded steel with angle iron frame. Use spun or die formed inlet cones to provide a streamlined flow into the wheel. Use airfoil blades welded to spun wheel cones unless otherwise indicated. Shafts shall be AISI C 1045 hot rolled steel turned, ground and polished. Shaft shall be sized for at least 125% of the fans maximum cataloged RPM.
- C. Bearings to be self-aligning grease packed pillow block type with grease seal and external grease fittings with a minimum L50 life of 200,000 hours at the maximum cataloged operating speed. Provide each fan housing with a capped drain connection and bolted and gasketed access door for inspection of fan wheel. Unless a special coating is scheduled, paint fans with a prime coat after metal cleaning and surface preparation; apply a second coat of paint to all exterior surfaces.
- D. Fans shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.
- E. Provide one inch galvanized mesh inlet screens for fans without inlet ductwork.

2.03 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: PennBarry, Greenheck, New York Blower, Peerless, Penn, Twin City.
- B. Construct housing of welded steel with reinforcing to prevent distortion. Furnish with streamlined inlet cones and multiple straightening vanes following the fan wheel to minimize noise and reduce turbulence. Provide each housing with a bolted and gasketed access door for inspection of drive and fan wheel. Use non-overloading airfoil blade fans welded to the wheel cones. Isolate belt drives from airstream with a belt tube. Externally mount motors on an adjustable base. Bearings to be grease lubricated, self-aligning ball bearing type with grease seal and external grease fitting. Unless a special coating is scheduled, paint fans with a prime coat after metal cleaning and surface preparation. Apply a second coat of paint to all exterior surfaces.
- C. Provide one inch galvanized mesh inlet screens for fans without inlet ductwork.

2.04 – EXECUTION

3.01 INSTALLATION

- A. Install as shown on the drawings, as detailed, and according to manufacturer's installation instructions. On units provided with a drain connection, reduce drain connection down to ½" fitting and leave open.
- B. Install thrust restraints in accordance with the requirements of Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.
- C. Contractor shall balance blade assembly of destratification fans after installation to assure stable operation.

3.02 TRAINING

- A. See Section 23 05 00 – Common Work Results for HVAC for general training requirements.
- B. In addition to the training provided in Section 23 05 00, provide an additional **1 hour** of training for each type of fan provided on the project.

END OF SECTION

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SECTION 23 37 13
DIFFUSERS, REGISTERS & GRILLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specifications for air terminal equipment. Included are the following topics:
1. Side-Wall Registers and Grilles

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this section.
B. Section 23 05 00 – Common Work Results for HVAC
C. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
D. Section 23 31 00 – HVAC Ducts and Casings
E. Section 23 33 00 – Air Duct Accessories

1.04 SUBMITTALS

- A. Refer to Section 23 05 00 – Common Work Results for HVAC, Submittals. In addition to the general content specified under Section 20 05 00 – Common Work Results for HVAC, supply the following submittals:
1. Heavy Duty Side-wall Return/Exhaust Grille
B. Furnish submittal information including, but not limited to, the following:
1. Manufacturer's name and model number
2. Identification as referenced in the documents
3. Capacities/ratings
4. Materials of construction
5. Sound ratings
6. Dimensions
7. Finish
8. Color selection charts where applicable
9. Manufacturer's installation instructions
10. All other appropriate data

1.05 REFERENCE STANDARDS

- A. NFPA 90A Installation of Air Conditioning and Ventilation Systems.
B. UL 181 Factory-Made Air Ducts and Connectors.
C. AHRI-ADC Standard 880

1.06 QUALITY ASSURANCE

- A. Refer to Division 1 for equals and substitutions.

1.07 DESIGN CRITERIA

- A. All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test Code 1062 GRD 84.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Kees, Carnes, Krueger, Titus, Nailor, Metal-Aire, and E.H. Price.
B. Acceptable manufacturers for specific products are listed under each item.
C. White, baked enamel finish or powder coat finish, unless otherwise indicated.

2.02 HEAVY DUTY SIDE-WALL RETURN/EXHAUST GRILLE

- A. Kees model GHD40, Titus model 30, Carnes Sturdicore, Price 91, Metal Aire series SBG, Krueger series 480, Price model 91.
- B. Grille border minimum 16-gauge steel face plate and grille blades 14-gauge steel suitable for gymnasium applications.
- C. Fixed blade 40 degree.
- D. Grille sizes as shown on drawings and/or as scheduled.
- E. Refer to architectural plan for ceiling installation conditions types. It is the responsibility of the contractor to coordinate frame and border of diffusers with general contractor.
- F. White, baked enamel finish or powder coat finish, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.
- B. Furnish diffusers with equalizing grids where it is not possible to maintain minimum 2 duct diameter straight duct into diffuser. Equalizing grids shall consist of individually adjustable vanes designed for equalizing airflow into diffuser neck and providing directional control of airflow.
- C. Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.
- D. Seal connections between ductwork drops and diffusers/grilles airtight.
- E. Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

END OF SECTION

SECTION 23 82 00
HEATING AND COOLING TERMINAL UNITS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide all labor and materials for a complete system in this specification section.

1.02 SECTION INCLUDES

- A. This section includes specification for heating and cooling terminal equipment using water and/or steam as the source. Included are the following topics:
 - 1. Electric Heaters

1.03 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 13 – Common Motor Requirements for HVAC Equipment
- D. Section 23 09 93 – Sequence of Operations for HVAC Controls
- E. Section 23 33 00 – Air Duct Accessories

1.04 SUBMITTALS

- A. Refer to Section 23 05 00 – Common Work Results for HVAC. In addition to the general content specified under Section 23 05 00 – Common Work Results for HVAC, supply the following submittals:
 - 1. Electric Heaters
- B. Include dimensions, capacities, materials of construction, ratings, weights, wiring diagrams, and appropriate identification for all equipment in this section. Include color selection chart where applicable.

1.05 REFERENCE STANDARDS

- A. AHRI 210 Standard for Unitary Air-Conditioning Equipment
- B. AHRI 410 Standard for Forced-Circulation Air-Cooling and Air-Heating Coils
- C. CS 140

1.06 QUALITY ASSURANCE

- A. Refer to Division 1 for equals and substitutions

1.07 DESIGN CRITERIA

- A. Forced Circulation Coils: Ratings certified in accordance with AHRI 410.
- B. Electrical Equipment and heaters shall be UL listed for the service specified.
- C. Electrical components and work must be in accordance with National Electrical Code.

1.08 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified in Section 23 05 00 – Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 ELECTRIC HEATERS

- A. Manufacturers: Berko, Chromalox, Markel, Trane.
- B. Use corrosion resistant heating elements, designed and spaced for even distribution of air across the heating element, and installed to prevent noise of expansion and contraction.
- C. Provide units with necessary overheat protection, reset devices, air flow interlock switch, contactors, transformers, local non-fused disconnect switch that is prewired, and other controls as may be required by codes.

- D. Fan powered units must be provided with thermostat and controls to maintain fan operation until residual heat in the heating elements has been dissipated. The fans and motors shall be balanced and mounted for vibration free operation.
- E. Construct cabinets of 20 gauge steel, furnished exposed cabinets with a baked enamel finish in one of the manufacturer's standard colors, selected by Architect.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install units in accordance with manufacturer's installation instructions.
- B. Coordinate location of units with other trades to assure correct recess size for recessed units.
- C. After installation, provide protective covers to prevent accumulation of dirt on units during balance of construction.

3.02 ELECTRIC HEATERS

- A. Install units where indicated on the drawings and details. Where heaters are indicated to be installed in ductwork, provide manufacturers recommended upstream and downstream ductwork to prevent overheating problems.
- B. Electric heaters located in toilet and shower rooms must be installed at least 6” above the finished floor.
- C. Units will be wired by the Electrical Contractor.

3.03 TRAINING

- A. See Section 23 05 00 – Common Work Results for HVAC for general training requirements.
- B. In addition to the training provided in Section 23 05 00 – Common Work Results for HVAC, provide an additional 1 hours of training for each type of heating and cooling terminal unit provided on the project.

END OF SECTION

**SECTION 26 00 00
ELECTRICAL**

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide complete electrical service and distribution system with equipment and materials where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Underground Electric Service (200-amp, 1-phase, 120/240 volt), service disconnect -meter cabinet with service ground, distribution panel with main circuit breaker, SPD device and branch circuit breakers;
 2. Branch circuit wiring, for lighting, receptacles, motors and equipment;
 3. Lighting fixtures;
 4. Wiring system for equipment and controls provided under other Sections of these Specifications including General Construction, Plumbing and HVAC trades;
 5. Lighting Control System;
 6. Power to new site lighting and new lighting and receptacles at existing shelter.
 7. Power to door operators and electric hand dryers by others.
 8. Hangers, anchor sleeves, chase supports for fixtures, and other electrical materials and equipment;
 9. Demolition and deactivation of electrical systems in existing facilities as noted on Site Drawings.
 10. Other items and services required to complete the electrical systems.
- B. Related Work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications;
 2. Equipment structural supports, etc.;
 3. All line voltage control wiring and starter interlocks, where specified;
 4. Final equipment electrical connections.
- C. Work of Other Sections:
1. Low-voltage (less than 100 volts) controls for General Construction, Plumbing, and HVAC trades.

1.02 GENERAL PROVISIONS

- A. Everything essential for the completion of the work implied to be covered by these Specifications to make the system ready for normal and proper operation must be furnished and installed by this Contractor. Accordingly, any omission from either the plans or the Specifications, or both, of details necessary for the proper installation and operation of the system shall not relieve this Contractor from furnishing such detail in full and proper manner.
- B. In addition to the electrical plans, see General Plans of the building, as all electrical work appearing on the latter plans will be part of this contract unless especially specified to be done by other contractors, as well as, the said work detailed on the electrical plans.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. Reference Standard: The following standards are imposed, as applicable to the work: 11
- | | |
|------|---|
| ASTM | American Society of Testing and Materials |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NFPA | National Fire Protection Association |

- A. UL Underwriters laboratories

1.04 CODES AND PERMITS

- A. The Contractor must comply with national, State of Wisconsin and City of Kenosha building and electrical codes and other ordinances in force where the building is located as far as same apply to his work.
1. IBC 2015
 2. IEEC 2015
 3. NEC 2014
 4. Wisconsin Electrical Code SPS Sections
- B. He must secure permits from proper offices and pay fees as may be necessary for fulfilling the requirements of these sections.
- C. One (1) copy of all permits must be furnished to the Owner.
- D. Electric Service Fee: Electrical Contractor shall secure and pay all fees for new electrical service from electric utility, including temporary power services.

1.05 COORDINATION

- A. Cooperate and coordinate with other trades to assure that all systems in the electrical work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.
- B. Arrange electrical work in neat, well-organized manner with piping and similar running parallel with primary lines of building construction.
- C. Locate operating and control equipment properly to provide easy access and install entire electrical systems with adequate access for operation and maintenance.
- D. Give right-of-way to piping which must slope for drainage.

1.06 ELECTRICAL PROVISIONS OF THE MECHANICAL WORK

- A. Line Voltage Wiring: The Electrical Contractor shall make all line voltage (100 volts and greater) electrical wiring, final connections and motor wiring for Mechanical equipment.
- B. Control Wiring: Low-voltage (less than 100 volts) control wiring in conjunction with Mechanical work shall be by the Mechanical Contractor in strict accordance with the applicable sections of the Electrical Specification.
- C. Motors, Starters, and Disconnects: All motors starter and disconnects shall be provided by the Electrical Contractor, unless provided with the equipment or indicated otherwise.
1. Mechanical Contractors shall furnish list of and location of all Mechanical equipment and requirements for electrical connections, along with wiring diagrams.

1.07 FLOOR, WALL, ROOF AND CEILING OPENINGS.

- A. The General Contractor will be required to leave openings in new construction ceiling, floors, walls, roof, partitions, etc., as required to install the Electrical work specified or shown on the Drawings. The Electrical Contractor is responsible for correct size and location of openings.
- B. Provisions for openings, holes and clearances through new construction walls, floors, ceilings and partitions are to be made in advance of construction of such parts of the building.
- C. The Electrical Contractor shall set sleeves and anchors for all equipment, etc., and shall provide watertight seals on pipes through exterior walls, floors and roof locations, and where noted on the Drawings.

1.08 CUTTING AND PATCHING

- A. General: Refer to Division 1 General Requirements.
- B. Perform all cutting and patching required for complete installation of the Electrical systems, Unless specifically noted otherwise. Provide all materials required for patching unless otherwise noted.
1. All cutting and patching necessary of structural members to install any Electrical work shall not be done without permission, and then only carefully done under the direction of the Architect and General Contractor.

1.09 TRENCHING AND BACKFILLING

- A. Comply with pertinent provisions of Division 1.
- B. Perform trenching and backfilling associated with the work of this Section and in strict accordance with the provisions of Division 2 of the Specifications.

1.10 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Shop Drawing Submittals: Submit six (6) copies of shop drawings to the Architect for approval with complete detail for all equipment, materials, etc., to be furnished and installed for this project follows:
 - 1. Electric Service Equipment;
 - 2. Distribution Panelboards;
 - 3. Starters and Disconnects;
 - 4. Light Fixtures;
 - 5. Electrical Devices.
 - 6. Lighting
- C. Shop Drawings:
 - 1. The Electrical Contractor will be held responsible for correction of work deemed necessary by the Engineer due to proceeding with the electrical work without approved shop drawings that have the Architect/Engineers final approval.
 - 2. Shop drawings shall include data on physical dimensions, gauges, materials of construction and capacities. Incomplete drawings will be disapproved.
 - 3. This Contractor will be responsible for all figures, quantities and dimensions shown on the shop drawings.
 - 4. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve this Contractor from responsibility of resubmitting equipment that will meet the space requirements.
- D. As-built Drawings: Record installation as-built on a set of blue-line prints during construction. Plan shall represent actual locations, materials and circuiting of equipment installed.

1.11 PRODUCT HANDLING

- A. Comply with pertinent provisions of Division 1.

1.12 WARRANTY

- A. In addition to standard one year warranty on all labor and materials, provide an additional warranty on ballasts for all new fluorescent and HID lighting fixtures as specified.

1.13 HOUSEKEEPING AND CLEAN-UP

- A. Periodically as work progresses and/or as directed by the Architect, the Contractor shall remove waste materials from the building and leave the area of the workroom clean. Upon completion of work remove all tools, scaffolding, broken and waste materials, etc., from the site.

1.13 HOUSEKEEPING AND CLEAN-UP

- B. This Contractor shall provide temporary lighting and power as required throughout the construction period.
- C. Arrange for temporary electrical utility with local electrical utility. Electrical Contractor shall pay all temporary electrical service and usage fees.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide only materials that are new, of the type and quality specified. Where Underwriters' Laboratories, Inc. has established standards for such materials, provide only materials bearing the UL label.

2.02 SERVICE ENTRANCES AND METERING

- A. New Service: Provide new underground 200A, 120/240 volt, 1-phase, 3-wire electric service from pad-mounted transformer as required by the local electrical utility (MG&E) and as shown on Drawings.
- B. Metering: Provide combination service disconnect with ground and metering socket cabinet for exterior mounting and related metering equipment per local electrical utility requirements(MG&E).

Utility approved metering equipment: Milbank U5784-O-200-5T-CB 10

- C. Main Switches: Provide a 200-amp main circuit breakers in the service metering cabinet with current limiting capabilities to meet utility AIC requirements.
- D. Service Distribution Panel (Panel 'A'):
 - 1. Provide 200-amp, 1-phase main distribution panel as indicated on plans complete with 200-amp main circuit breaker, 10,000 AIC branch circuit breakers, NEMA 1 enclosure, main service ground and solid neutral buss lugs and other components required for a complete installation.
 - 2. SPD service device as specified herein and scheduled on Drawings.

2.03 SURGE PROTECTIVE DEVICES

- A. The surge protective device (SPD) shall be designated a location Type 2 device intended for installation on the load side of the service equipment overcurrent device, including SPDs located at the branch panel. The SPD shall be Listed in accordance with UL 1449.
- B. The SPD shall be made up of metal oxide varistors (MOV's), or a combination of MOV's with selenium cells or silicon avalanche diodes, ensuring that all of the performance requirements are met. Gas tubes shall not be used.
- C. The SPD shall have a maximum continuous operating voltage (MCOV) rating not less than 115% of nominal voltage of the system it is protecting.
 - 1. MCOV = 150 volt. 36
- D. Protection Modes: The SPD shall have line to neutral (L-N), line to ground (L-G), line to line (L-L) and neutral to ground (N-G) protection modes for grounded wye configured systems. For a delta configured system, the device shall have line to line (L-L) and line to ground (L-G) protection modes.
- E. Voltage Protection Rating (VPR): The UL 1449 Voltage Protection Rating (VPR) for the device shall not exceed the following:
 - 1. Surge current per phase rating: 80kA
 - 2. 240/120 volt applications: 900V L-N, 1200V L-G, 700V N-G, 1500 L-L
- F. Nominal Discharge Current (In): The SPD shall have a UL 1449 Nominal Discharge Current Rating (In) of not less than 20kA.
- G. Short Circuit Current Rating (SCCR): The SPD shall have a UL 1449 Short Circuit Current Rating (SCCR) of not less than 200kA.3

2.04 GROUNDING SYSTEM

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Mount motors on a rigid base designed to accept a motor, using metal shims as required under each mounting foot to obtain a secure installation.
- B. Inspect and align each motor when direct coupled to the driven device. Alignment shall be within HVAC equipment manufacturer's limits.
- C. Perform dynamic balancing and test motors for vibration after manufacture. Self-excited vibration velocity of motors shall not exceed 0.157/0.06 inches per second at bearing caps.
- D. Inspect and align each motor when flexible coupled to the driven device. Use a dial indicator to check angular misalignment of the two shafts. Adjust the motor position as required so that the angular misalignment of the shafts does not exceed 0.002" per inch diameter of the coupling hub or the HVAC equipment manufacturer's limits, whichever is more stringent. Use a dial indicator to check the shaft for run-out to assure concentricity of the shafts. Adjust as required so that run-out does not exceed

0.002” per inch diameter of the coupling hub or the HVAC equipment manufacturer’s limits, whichever is more stringent.

- E. Inspect and align each motor when connected to the driven device by means of a belt drive. Mount motor sheaves on the appropriate shafts as recommended by the equipment and motor manufacturers. Use a straight edge to check alignment of the sheaves. Reposition the sheaves as required to obtain the proper alignment. After the sheaves are aligned, adjust the motor base as required so that the belt(s) can be added and then tighten the motor base so that the belt tension is in accordance with the drive manufacturers recommendations. Frequently check the belt tension during the first 24 hours of operation and again after 80 hours of operation for proper belt tension. Adjust belt tension as required.

3.02 START-UP

- A. Test start each motor to verify proper rotation prior to operating system.
- B. Lubricate all motors as recommended by motor manufacturer. Record lubrication material used and frequency of use. Include this lubrication log in the Operation and Maintenance manuals.

END OF SECTION

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SECTION 31 10 00
SITE CLEARING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

These specifications generally follow the design guidelines established by the “Standard Specifications for Public Works Construction” by the City of Madison, Wisconsin. The standards can be found at <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

END OF SECTION 31 10 00

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SECTION 31 20 00
EARTH MOVING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

These specifications generally follow the design guidelines established by the “Standard Specifications for Public Works Construction” by the City of Madison, Wisconsin. The standards can be found at <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

END OF SECTION 31 20 00

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**SECTION 32 12 16
ASPHALT PAVING**

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

These specifications generally follow the design guidelines established by the “Standard Specifications for Public Works Construction” by the City of Madison, Wisconsin. The standards can be found at <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

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SECTION 32 13 13
CONCRETE PAVING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

These specifications generally follow the design guidelines established by the “Standard Specifications for Public Works Construction” by the City of Madison, Wisconsin. The standards can be found at <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

END OF SECTION 32 13 13

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SECTION 32 33 00
SITE FURNISHINGS

PART 1 – GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, shop drawings showing installation and color Samples.
- B. Maintenance Data: Include recommended methods for repairing damage to the powder coat finish.
- C. Store bicycle parking racks in original undamaged packages and containers until ready for installation.
- D. Handle powder coated bicycle parking racks with sufficient care to prevent any scratches or damage to the finish.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, hot-dip galvanized.
- B. Steel Pipe: ASTM A 53/A 53M or ASTM A 13, hot-dip galvanized.
- C. Steel Tubing: ASTM A 500 0, hot-dip galvanized.
- D. Steel Finish: Powder coat, color as selected by City Parks Staff from full line of manufacturer's standard colors.

2.2 SITE FURNISHINGS

- A. Bicycle Racks:
 - 1. Basis of Design: Madrax Spartan
 - 2. Bicycle Rack Construction: Steel galvanized steel tubing
 - 3. Style: Double-side parking
 - 4. Installation Method: Surface mount on concrete slab, anchor with 1/2" stainless steel expansion anchors with 3" embedment.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Handle and install bicycle parking racks in accordance with manufacturer's recommendations and installation instructions.
- B. General: Anchor bicycle rack securely, positioned at locations and elevations indicated.

END OF SECTION 32 33 00

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SECTION 32 92 00
TURF AND GRASSES

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

These specifications generally follow the design guidelines established by the “Standard Specifications for Public Works Construction” by the City of Madison, Wisconsin. The standards can be found at <http://www.cityofmadison.com/business/pw/specs.cfm>. Work not specified herein or as directed by the Owner shall follow these standards.

END OF SECTION 32 92 00

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**SECTION 33 11 00
WATER UTILITY DISTRIBUTION PIPING**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide water distribution system components and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. The limits of the work, including the responsible party for testing purposes, shall be clearly defined on the Drawings.
- B. All materials and methods shall meet the City of Madison public works standards 14 Articles 701 thru 704.

1.02 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 22 11 00 – Facility Water Distribution
- C. Section 22 13 00 – Facility Sanitary Sewerage

1.03 SUBMITTALS

- A. Provide manufacturers product information (cut sheets) and O&M information for watermain materials including:
 - 1. Pipe
 - 2. Fittings
 - 3. Valves
- B. Provide copies of all pressure and electric continuity testing procedures and results for the project to the Project Representative and the AE within 48 hours of completing the individual tests.
- C. Provide reports that document safe sample collection procedures and results.

1.04 REFERENCE DOCUMENTS

- A. Where reference is made to the “SSSWC”, it shall mean pertinent sections of the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition. Method of measurement and basis of payment sections in referenced documents shall not apply.
- B. Where these specifications do not cover portions of the work to be undertaken, the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition, shall govern the work

1.05 REFERENCE STANDARDS

- A. ASTM B88 Standard Specifications for Seamless Copper Water Tube
- B. ASTM F477 Standard Specifications for Elastomeric Gaskets for Joining Plastic Pipe
- C. ASTM D3139 Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- D. ASTM D3350 Standard Specifications for Polyethylene Plastic Pipe and Fittings Materials

1.06 CONTINUITY OF EXISTING WATER DISTRIBUTION SYSTEM

- A. Provide a construction schedule to Project Representative, municipal water utility (if applicable) and local fire department (if applicable) for review and approval prior to starting construction. Schedule shall indicate the date and time of all required water supply interruptions.
- B. Do not interrupt existing water supply without approval from Project Representative, municipal water utility, and local fire department.

- C. Once approved, notify all distribution system users impacted by outages a minimum of 48 hours in advance of outage. Notification shall be provided in writing and describe the nature and duration of outages, and provide the name and number of Contractor's foreman or other contact.

1.07 PROVISIONS FOR FUTURE WORK

- A. Construct watermain system in a manner that will facilitate future extension or connection.
- B. Unless otherwise shown on the drawings, provide valves on "dead end" mains that will allow dry connection to the watermain system. Terminate "dead end" mains with full length of pipe beyond the valve, and a bell end with restrained plug.

1.08 AS-BUILD DRAWINGS

- A. Show the actual locations of watermain and services, valves and hydrants on drawings and show changes to proposed watermain size, alignment, or grades. Show the actual locations, sizes and types of underground utilities and other features encountered during construction.

PART 2 – MATERIALS

2.01 DUCTILE IRON WATERMAIN

- A. Manufacturers Ductile watermain shall be Class 52, ANSI/AWWA C151/A21.51 centrifugally cast, cement mortar lined meeting the requirements of ANSI/AWWA C104/A21.4.
- B. Ductile iron watermain joints shall be rubber gasket push-on joint or mechanical joint meeting the requirements of ANSI/AWWA C111/A21.11.
- C. Pipe shall be provided with conductive bonding straps to provide electrical continuity.
- D. Pipe shall be manufactured in the United States.

2.02 COPPER WATER SERVICE

- A. BELOW GROUND 2-1/2" AND SMALLER:
 - 1. Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.

2.03 DUCTILE IRON WATERMAIN FITTINGS

- A. Fittings shall be ductile iron cement mortar lined mechanical joint compact style fittings meeting the requirements of ANSI/AWWA C153/A21.53.
- B. Fittings shall be manufactured in the United States.

2.04 VALVES

- A. Resilient Wedge Gate Valve
 - 1. Resilient seated wedge gate valve meeting the requirements of AWWA C509 and C515. Body, bonnet and gate shall be constructed of ductile iron. Bolts shall be stainless steel.
 - 2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Symmetrical wedge shall be completely encapsulated with resilient material.
 - 3. Valve stem shall be non-rising, low-zinc (zinc content not to exceed 6%) bronze. Valve stem shall have an integral thrust collar. Thrust collar bearings shall be designed to withstand maximum torque without distortion.
 - 4. Stem seal shall be so designed that the O – ring above the stem collar can be replaced while the valve is under pressure and in the fully open position.
 - 5. Valve shall be left opening and be provided with standard 2" square operating nut.
 - 6. Valve shall be provided with mechanical joint connections. Mechanical joint ends shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
 - 7. Mueller, Kennedy, US Pipe, American Flow Control, Clow, or approved equal.
- B. Butterfly Valve

1. Rubber-seated butterfly valve meeting the requirements of AWWA C504, for Class 150B. Body and disc shall be constructed of ductile iron. Bolts shall be stainless steel. Disc shall be lens shaped.
 2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Disc shall be provided with a stainless steel disc edge.
 3. Valve stem shall be stainless steel. Packing shall be permanent duty "chevron V-type" or "O-ring" type. Bearings shall be permanent, non-metallic, and self-lubricating.
 4. Valve seat shall be a single piece of elastomeric material that is not penetrated by the valve shaft.
 5. Provide manual operator that is suitable for underground service and includes a standard 2" square operating nut.
 6. Valve shall be provided with mechanical joint connections. Mechanical joint ends shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
 7. Mueller/Henry Pratt, Kennedy or approved equal.
- C. Tapping Valve
1. Resilient seated wedge gate tapping valve having 100% port, and meeting the requirements of AWWA C509 and C515. Body, bonnet and gate shall be constructed of ductile iron. Bolts shall be stainless steel.
 2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Symmetrical wedge shall be completely encapsulated with resilient material.
 3. Valve stem shall be non-rising bronze. Stem collar shall be provided with thrust bearings that are protected by upper and lower O-ring seals both above and below.
 4. Valve shall be left opening and be provided with standard 2" square operating nut.
 5. Valve shall be provided with flange connection on inlet side of valve and mechanical joint connections on outlet side of valve. Mechanical joint end shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
 6. Provide suitable companion tapping sleeve.
 7. Mueller, US Pipe, American Flow Control, Clow, or approved equal.

2.05 BRASS WATER SERVICE FITTINGS

- A. Service Saddles
1. Double strap, bronze service saddles meeting the requirements of AWWA C800. Service saddles shall be provided with nitrile O-ring gasket and AWWA Taper outlet.
 2. Service saddles shall be properly sized to accommodate both the main and service lines.
 3. Mueller BR 2B Series, Ferguson, Romac, or approved equal.
- B. Corporation Stops
1. Corporation stops shall be brass, ball style. Inlets shall be AWWA Taper; outlet connection shall be compression having a positive indicator to avoid over-tightening.
 2. Corporation stops shall be Mueller B-25008, A.Y. McDonald Mfg. Co., or approved equal.
- C. Curb Stops
1. Curb stops shall be brass, with compression connections having a positive indicator to avoid over-tightening. Curb stops shall be provided with a quarter turn check.
 2. Curb stops shall be Mueller B-25209, A.Y. McDonald Mfg. Co., or approved equal.
- D. Unions
1. Unions shall be 3-piece brass, with compression connections having a positive indicator to avoid over-tightening.
 2. Unions shall be Mueller H-15403, A.Y. McDonald Mfg. Co., or approved equal.
- E. U-Branch, Wyes, Etc.
1. U-branch, wye and other fittings shall be brass, with compression connections having a positive indicator to avoid over-tightening. Fittings shall be produced specifically for water supply applications.

2. Mueller, A.Y. McDonald Mfg. Co., or approved equal.

2.06 VALVE BOXES

- A. Gate/Butterfly Valve Boxes
 1. Valve boxes shall be screw type and shall consist of a base, middle section, top section with cover and intermediate extension sections. The top section shall be designed to thread onto the middle section so that the unit can be adjusted to a variable length. The top section shall be designed to receive a circular drop cover.
 2. The valve box and component parts shall be cast iron in accordance with ASTM-A48 class 20, 30, 35, or approved equal.
 3. Boxes shall be 5-1/4" with stay-put "WATER" cover.
 4. The cast iron valve box and components shall be free from blowholes, cold shots, shrinkage defects, cracks or other injurious defects and shall have a normal smooth casting finish.
 5. All cast iron valve boxes and components shall be thoroughly coated with asphaltic pitch varnish or approved equal.
 6. Provide valve box extensions as necessary to accommodate depth of cover shown on drawings, or 6.5-foot minimum.
 7. Valve boxes shall be Bingham & Taylor, East Jordan Iron Works, Tyler, or approved equal.
- B. Curb Stop Boxes
 1. Curb stop boxes shall be 1 1/4" minimum diameter, cast iron, arch style, valve boxes. Boxes shall be telescopic, extendable to accommodate 7' bury. Lid shall be two piece threaded, with a plug having a pentagonal bolt for removal.
 2. Provide valve box extensions as necessary to accommodate depth of cover shown on drawings, or 6.5-foot minimum.
 3. Ford, Mueller, or approved equal.

2.07 POLYETHYLENE ENCASUREMENT BAG

- A. 8-mil polyethylene encasement bag meeting the requirements of ANSI/AWWA C105/A21.5, Class "C" black.

2.08 BOARD INSULATION

- A. Insulation shall be rigid, closed-cell extruded polystyrene insulation suitable for buried installation. Individual boards shall have minimum dimensions of 8'x4'x2".
- B. Owens Corning, Dow Styrofoam, or approved equal.

2.09 TRACER WIRE

- A. Tracer wire shall be #10 solid copper wire with insulated jacket. Tracer wire insulation color for non-metallic, potable water pipe shall be blue. Tracer wire insulation color for non-metallic, non-potable water pipe shall be purple.

2.10 LOCATOR TAPE

- A. Tape shall be detectable metallic locator tape, specifically manufactured for marking utilities with a minimum width of 6 inches and detectable at a depth of 18".
- B. Tape for potable water shall be marked "WATER" and blue colored. Tape for non-potable water shall be marked "NON-POTABLE WATER" and purple colored.

2.11 CHLORINE

- A. Chlorine disinfectant shall be calcium hypochlorite tablets or granules. Calcium hypochlorite product shall meet requirements for AWWA C651 – Standard for Disinfecting Water Mains - latest revision.
- B. Arch "HTH", or approved equal.

2.12 PIPE JOINT LUBRICANT

- A. Petroleum free pipe lubricant formulated for use with potable water systems. Product shall meet the requirements of ANSI/AWWA C111/A21.11 - latest revision.

PART 3 – EXECUTION

3.01 GENERAL

- A. Complete exploratory excavations at utility crossings as shown on the drawings and as necessary to complete the work.
- B. Maintain clearances between watermains and existing or proposed sewer lines as follows:
 - 1. 8' horizontal separation (measured center to center) between watermains and existing or proposed sanitary or storm sewers.
 - 2. 12" vertical separation (measured from outsides of pipes) where watermains cross over sanitary or storm sewers.
 - 3. 18" vertical separation (measured from outsides of pipes) where watermains cross under sanitary or storm sewers.
- C. Notify the A/E and Project Representative of utility conflicts as soon as they are encountered.
- D. Store and handle pipe in accordance with manufacturers' recommendations. Keep pipes clean of soil, debris and animals.
- E. Watermain construction shall be completed in a manner that minimizes interruptions to existing services.

3.02 CONNECTIONS TO EXISTING WATERMAINS/TAPPING

- A. Provide tapping sleeves, valves, cutting-in sleeves and other materials specifically manufactured for use with the type of pipe to which the connection is being made.
- B. Notify the Project Representative if the proposed point of connection is located within 4' of an existing joint.
- C. Connections shall be made at existing pipe stubs, valves or other fittings.
- D. At connections to existing mains, locate the new valve as close to the existing main as possible. Swab the interior surfaces of all pipe, fittings, valves that will be exposed to the existing system. Swab solution shall consist of a 5% (by weight) solution of calcium hypochlorite.

3.03 BEDDING /UTILITY COVER

- A. Provide bedding and utility cover in accordance with the applicable requirements of Section 31 23 16.13 – Trenching.
- B. Watermain and water service piping shall be provided with 6" of bedding material and 12" of utility cover material (both measured at the bell of the pipe).
- C. Bedding and cover material for various types of pipe shall consist of the following:
 - 1. Ductile Iron Watermain: Bedding sand or crushed stone screenings.
 - 2. PVC Watermain: Crushed stone bedding.
 - 3. Copper Water Services: Bedding sand or crushed stone screenings.

3.04 LAYING WATERMAIN

- A. Install pipe in accordance with the SSSWC and ASTM specifications that pertain to the specified type of pipe material and the installation situation.
- B. Provide a minimum of 6.5' of cover over watermain, unless otherwise shown on the drawings or directed by the Project representative. For watermains with less than 6.5' of cover, provide insulation as shown on the drawings, or as directed by the Project Representative.
- C. Lay watermain at uniform grades between deflection points shown on the drawings; do not install watermains with intermediate high points.
- D. Unless otherwise shown or approved by the Project Representative, lay pipe with bell end facing the direction of pipe laying.
- E. For ductile iron watermain, place polyethylene encasement bag on watermain prior to lowering into trench. Once pipe is joined, pull bag over entire length of pipe, overlap joint at adjacent pipe and secure using "Duct" tape or other approved method.
- F. Prepare pipe bell and gasket in accordance with manufacturers requirements. Lubricate bell and/or pipe with AWWA/NSF approved lubricant.
- G. Push pipe home in accordance with manufacturer's recommendations regarding tools and methods.
- H. Pipe joint deflection shall not exceed manufacturer's requirements.

- I. For ductile iron pipe, connect bonding straps or lugs to provide electrical continuity along entire watermain. Provide exothermic weld to attach new bonding straps, when existing straps are missing or damaged. Follow manufacturer’s requirements for exothermic welding procedures.
- J. Locate the geographic location of all dead end watermains and services and note actual location on As-Built Drawings.
- K. Disinfect pipe by placing calcium hypochlorite in each section of pipe as pipe laying progresses. Provide dosage as indicated on Table 33 11 00-1.

Watermain Nominal Diameter (inches)	Dose Calcium Hypochlorite* (oz./length pipe)
4-6	1
8	3
10	5
12	7

* Granular/tablet calcium hypochlorite with 68% (weight) available chlorine
Table 33 11 00-1

- L. When required, provide board insulation in the thickness and width shown on the drawings. Unless otherwise shown, insulation shall be provided at a minimum thickness of 2 inches.
- M. Install insulation on compacted initial cover material 6 inches above the top of pipe. Stagger joints when placing multiple layers of insulation.
- N. Provide insulation with a minimum of 1 foot of utility cover material. Place backfill material in manner that does not damage insulation; replace damaged insulation.

3.05 TRACER WIRE

- A. Provide tracer wire for buried non-metallic water piping. Tracer wire shall be installed directly above the top of pipe and within six inches of the pipe.
- B. Splices in tracer wire shall be made with split-bolt or compression-type connectors.
- C. Access points are required every 400 feet. At access points the tracer wire shall be brought to grade in valve boxes, utility structures or other covered access devices.

3.06 LOCATOR TAPE

- A. Install locator tape directly above new non-metallic sanitary sewer pipe approximately 15 inches below finished grade. Bring tape to surface and terminate in valve box or other structure.

3.07 FITTINGS, VALVES AND HYDRANTS

- A. Install fittings, valves and hydrants at locations shown on the drawings.
- B. Unless otherwise shown, provide restrained mechanical joint connections. Install materials in accordance with manufacturer’s recommendations.
- C. Maintain electrical continuity through all fittings, valves and hydrants. Provide and install suitable jumper cables for epoxy coated valves.
- D. Place hydrants and valves on 4”x8”x16” solid concrete masonry units set on compacted soil.
- E. Install joint restraints in accordance with the requirements of this section.
- F. Install valve box so that bonnet rests on compacted initial backfill material at the same elevation as the top of the valve stuffing box. Center the valve box over the valve nut.
- G. Install valve box plumb and level, backfilling evenly. Extend valve box to proposed final grade; provide valve box extensions as necessary. Valve boxes that shift during backfilling or restoration shall be excavated and re-set.
- H. Mark all valve boxes with a steel “U” fence post to protect them from damage.
- I. Install hydrants at elevation shown on drawings or as required to provide a minimum of 6.5’ cover over the hydrant lead.
- J. Place approximately ½ cy of clear stone bedding material from the base of the hydrant to 6” above the drain holes on the hydrant elbow. Cover clear stone material with a “skirt” of polyethylene encasement bag material to prevent backfill material from migrating into the clear stone.

- K. Install hydrant plumb and level, backfilling all sides evenly.
- L. Cover all new hydrants with a plastic garbage bag or similar cover until the main has been filled and placed in service.

3.08 JOINT RESTRAINT

- A. Unless otherwise noted, all fittings, valves and hydrants shall be installed with restrained joints. Joint restraints shall be used on the adjacent full length (or more lengths as shown on the drawings) of pipe on all sides of fittings. Additionally, branch runs of pipe shall be installed with restrained joints beginning at the fitting at the main to the first valve.
- B. Hydrant leads shall be provided with restrained joints beginning at the fitting at the main to the hydrant.
- C. Joint restraint shall be provided using retainer glands.
- D. Install all joint restraint products in accordance with manufacturer's recommendations and drawings.

3.09 COPPER WATER SERVICES AND BRASS FITTINGS

- A. Connect copper water service piping to watermain, wellhouse, or other supply as shown on the drawings.
- B. Watermain taps shall be made under pressure using a tapping machine specifically designed to tap and install corporation stops. Dry watermain taps are not allowed.
- C. Service saddles shall be installed on services where the corporation stop is 1 ½" nominal diameter or greater.
- D. Provide a horizontal offset adjacent to the main for all copper services. Comply with pipe manufacturer's requirements with respect to minimum radius on bends.
- E. Install curb stops as shown on the drawings. If specific curb stop location is not shown on the drawings, consult with Project Representative to determine acceptable location prior to installing.
- F. Place curb stop box on a 4"x8"x8" solid concrete masonry unit set on compacted ground. Orient box so that no portion of the box bears on the water service or curb stop.
- G. Install curb stop box plumb and level and backfill all side simultaneously. Extend curb stop box to proposed final grade; provide extensions as necessary. Curb stop boxes that shift during backfilling or restoration shall be excavated and re-set.
- H. Install copper water service as shown on the drawings. Prepare copper pipe joints in accordance with pipe and fitting manufacturer recommendations. Cut pipe squarely, remove burs and round ends as necessary.
- I. Install fittings in accordance with manufacturer's recommendations. Torque compression connections to recommended tightness; do not over-tighten compression joints.
- J. Provide dead-end copper water services with compression connectors fitted with plugs. Do not tap or crimp the ends of copper water services shut.
- K. Locate the geographic location of all dead end services and curb stop boxes and note actual location on As-Built Drawings.

3.10 FILLING WATERMAIN

- A. Fill watermain after main has been installed and completely backfilled.
- B. Fill main slowly to limit entrapped air and evenly distribute calcium hypochlorite. Open all hydrants completely to allow air to escape and monitor filling.
- C. Once main is full, allow a minimum of 48 hours of time for disinfection to occur before flushing.

3.11 PRESSURE TESTING

- A. Refer to City of Madison specifications.
- B. Pressure test all watermain and copper water services.
- C. Provide all valves, fittings, joint restraints, hoses, compressors, water and power supply as necessary to complete pressure testing. Utilize testing apparatus that is fabricated specifically for testing watermains. Calibrate pressure gauges as necessary.
- D. Flush main as necessary to remove air prior to testing. Comply with the requirements of this section with respect to flushing.
- E. For longer installations or installations consisting of watermain and copper water service, the Contractor may elect to pressure test the system in short segments.

- F. All pressure testing shall be conducted in the presence of the Project Representative. Provide minimum of 48 hours advanced notice of testing.
- G. Conduct a combined pressure/leakage test for 1 hour at a pressure equal to 150% of system normal operating pressure (as measured at the lowest point in the system), or a minimum pressure of 150 psig.
- H. When conducting test, pressure test equipment shall be set-up as close to the highest point in the line as possible.
- I. Make-up water for the test shall be clean potable water supplemented with ½ oz of dry calcium hypochlorite per 35 gallons of water.
- J. Leakage for test shall not exceed gallons per hour as allowed by the attached formula:

$$G=(ND\sqrt{P})/7400$$

Where: G= Allowable leakage (gallons per hour of test)
 N=Number of joints under test
 D=Nominal diameter of main (inches)
 P=Average pressure during test (psig)

- K. Allowable leakage for high density polyethylene pipe shall be zero.
- L. Record and document pressure test by recording the following information:
 - 1. Date of test
 - 2. Section tested
 - 3. Diameter and length of main under test
 - 4. Number of fittings, valves hydrants, etc.
 - 5. Results of test including test length, pressure, actual water loss
 - 6. Calculation of allowable leakage
 - 7. If a failed test, describe actions taken to eliminate leaks and results of re-testing
- M. Submit reports documenting pressure testing.

3.12 ELECTRIC CONTINUITY TESTING

- A. Conduct electric continuity test on all ductile iron watermain and copper water services.
- B. The electric continuity test shall be performed using a multi-meter to verify electrical continuity of the watermain system.
- C. The Contractor shall furnish all labor and equipment necessary to conduct the electric continuity test.
- D. Document electric continuity testing by recording the following information:
 - 1. Date of test
 - 2. Test methods and equipment
 - 3. Section tested
 - 4. Diameter and length of main under test
 - 5. Number of fittings, valves hydrants, etc.
 - 6. Results of test including resistance
 - 7. If a failed test, describe actions taken to eliminate leaks and results of re-testing
- E. Submit reports documenting electric continuity testing.

3.13 DISINFECTION/FLUSHING

- A. After filling the main, allow a minimum of 48 hours of time for disinfection to occur before flushing.
- B. Flush all sections of watermain and water service. When possible, utilize hydrants or other large diameter orifices to complete flushing and achieve 2.5 fps water velocity. If needed, utilize services or temporary connections to complete flushing.
- C. All watermain and services shall be flushed for a minimum of 10 minutes, or as necessary to obtain a sediment-free and bacteriologically safe sample.
- D. Utilize diffusers, hoses, settling basins and other devices as necessary to limit erosion and other damage to the site and downstream areas.
- E. Contractor shall be responsible for providing all necessary fitting, valves, joint restraints, hydrants and other materials necessary to conduct flushing.
- F. Submit reports documenting disinfection and flushing.

3.14 BACTERIOLOGICAL SAMPLE

- A. Following all pressure testing and flushing, the contractor shall collect a sample from the newly installed watermain or water service(s). Samples shall be submitted to the State Laboratory of Hygiene, or other licensed testing laboratory for bacteriological (coliform bacteria) analysis.
- B. The Contractor shall be responsible for all costs associated with sample collection(s) and analysis.
- C. Document bacteriological sample collection and analysis by recording the following information:
 - 1. Date of sample collection
 - 2. Sample collection methods and equipment
 - 3. Person collecting the sample
 - 4. Location(s) sample was collected
 - 5. Results of sample analysis
- D. If sample results indicate water is “Unsafe – Coliform Bacteria Present”, Contractor shall re-disinfect watermain and water services by introducing additional chlorine into the line and re-flushing the main. This process shall be repeated as necessary until a clean sample is obtained. The Contractor shall be responsible for all costs associated with all efforts necessary to obtain a “Safe – Coliform Bacteria Not Present” sample.
- E. Submit reports documenting bacteriological sample collection and analysis.

END OF SECTION

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**SECTION 33 30 00
SANITARY SEWERAGE UTILITIES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the sanitary sewer work required in these specifications and on the drawings. The limits of the work, including the responsible party for testing purposes, shall be clearly defined on the Drawings.
- B. All materials and methods shall meet the City of Madison public works standards 14 Articles 501 thru 509.

1.02 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 22 11 00 – Facility Water Distribution
- C. Section 22 13 00 – Facility Sanitary Sewerage

1.03 SUBMITTALS

- A. Provide manufacturers product information (cut sheets) and O&M information for watermain materials including:
 - 1. Pipe
 - 2. Fittings
 - 3. Valves
- B. Provide wastewater diversion and pumping plan.
- C. Provide reports documenting all required testing and televising. testing results for the project to the Project Representative and the AE within 48 hours of completing the individual tests.

1.04 REFERENCE DOCUMENTS

- A. Where reference is made to the “SSSWC”, it shall mean pertinent sections of the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition. Method of measurement and basis of payment sections in referenced documents shall not apply.
- B. Where these specifications do not cover portions of the work to be undertaken, the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition, shall govern the work.

1.05 REFERENCE STANDARDS

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D2235	Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D2564	Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2680	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3350	Standard Specifications for Polyethylene Plastic Pipe and Fittings Materials
ASTM D4673	Standard Classification System for Acrylonitrile-Butadiene-Styrene (ABS) Plastics and Alloys Molding and Extrusion Materials
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.06 AS-BUILD DRAWINGS

- A. Show the actual locations of watermain and services, valves and hydrants on drawings and show changes to proposed watermain size, alignment, or grades. Show the actual locations, sizes and types of underground utilities and other features encountered during construction.

PART 2 – MATERIALS

2.01 PVC PIPE

- A. Conform to ASTM D-3034 with solvent weld or elastomeric joints. Pipe shall be SDR-35, unless otherwise noted. Pipe over 15 inches in diameter shall meet the requirements of ASTM F679-03. Do not mix different manufacturer's products, or fittings.
- B. PVC fittings shall be same joint type and SDR as connecting PVC sanitary sewer pipe.

2.02 HDPE PIPE

- A. Polyethylene Resin
 - 1. Polyethylene resin used for manufacturing piping and fittings shall meet ASTM D1248 for Type III, Class C, Grade P34, Category 5, with a PPI recommended designation of PE3408 and a minimum cell classification of PE 345434C in accordance with ASTM D3350. The polyethylene compound shall be combined with carbon black to provide protection against degradation by ultraviolet light. Pipe shall be made from virgin material with no rework compound, except that obtained from the manufacturer’s own production of the same formulation.
- B. Polyethylene Piping
 - 1. High density polyethylene (HDPE) piping, shall meet the requirements of AWWA C906, current version. Pipe dimensions and workmanship shall be in accordance with ASTM F714 and ASTM D2122. Pipe shall be of diameter shown on the drawings, with dimension ratio (DR) of DR11, unless otherwise noted.
 - 2. Pipe, fittings, and joints shall meet or exceed the following physical properties:

<u>PROPERTY</u>	<u>ASTM TEST METHOD</u>	<u>VALUE</u>
Density, gm/cc	D1505	0.955
Melt Index, gm/10 min	D1238-E	0.10
High Load Melt Index, gm/10 min	D1238-F	12.0
Tensile Strength @ Break, psi	D638	4,500
Tensile Strength @ Yield, psi	D638	>3,200
Elongation, %	D638	>800
Flexural Modulus, psi	D790	136,000
Environmental Stress Cracking Resistance F ₂₀ , Hours (100°C)	D1693 (Cond. C)	>5,000
Brittleness Temperature, °F	D746	<-180
Melting Point, °F	D789	261
Vicat Softening Temperature, °F	D1525	255
Hardness, Shore D	D2240	66
Volume Resistivity, ohm-cm	D991	2.6 10 ¹⁶
Recommended Hydrostatic Design Stress:		1600 psi @ 73.4°F 800 psi @ 140°F

- C. Pipe Marking
 - 1. Each length of straight and special HDPE pipe and each HDPE fitting shall be plainly marked on the outside to identify the design pressure or class of pipe, proper location of the pipe or fitting in the pipeline, and the date of manufacture.

2.03 CONNECTIONS FOR DISSIMILAR PIPE MATERIALS

- A. Where new sewer connects to an existing dissimilar pipe, the connection shall be made with a no hub type coupling meeting the requirements of CISPI 310.
- B. Couplings shall have neoprene gaskets with stainless steel shield, and multiple stainless steel clamps with worm gear tightening device. The couplings shall be made specifically for the type and size of pipe materials being connected.
- C. Couplings shall be Fernco, Husky, or approved equal.

2.04 BOARD INSULATION

- A. Insulation shall be rigid, closed-cell extruded polystyrene insulation suitable for buried insulation. Individual boards shall have dimensions of 8'x4'x2".
- B. Owens Corning, Dow Styrofoam, or approved equal.

2.05 TRACER WIRE

- A. Tracer wire shall be #10 solid copper wire with green insulated jacket.

2.06 LOCATOR TAPE

- A. Tape shall be detectable metallic locator tape, specifically manufactured for marking utilities with a minimum width of 6 inches and detectable at a depth of 18".
- B. Tape shall be marked "SEWER" and green colored.

PART 3 – EXECUTION

3.01 GENERAL

- A. Complete exploratory excavations at utility crossings as shown on the drawings and as necessary to complete the work.
- B. Maintain clearances between watermains and existing or proposed sewer lines as follows:
 - 1. 8' horizontal separation (measured center to center) between watermains and existing or proposed sanitary or storm sewers.
 - 2. 12" vertical separation (measured from outsides of pipes) where watermains cross over sanitary or storm sewers.
 - 3. 18" vertical separation (measured from outsides of pipes) where watermains cross under sanitary or storm sewers.
- C. Notify the A/E and Project Representative of utility conflicts as soon as they are encountered.
- D. Store and handle pipe in accordance with manufacturers' recommendations. Keep pipes clean of soil, debris and animals.

3.02 DIVERTING SEWAGE

- A. Tributary buildings and services will remain occupied during construction.
- B. Wastewater will continue to be discharged to the sanitary sewers during construction.
- C. Contractor shall provide, operate and maintain all diversion and pumping equipment necessary to carry out the work and allow wastewater to continue to be discharged to the sanitary sewer system.
- D. Provide all necessary generators or other power source necessary to operate pumps on a continuous basis.
- E. Extra pumping and power equipment shall be staged onsite to maintain sewage diversion in the event of failure of the primary pumping equipment.
- F. The Contractor is solely responsible for sewage diversion.

3.03 DIVERSION PLAN

- A. Contractor shall provide a wastewater diversion and pumping plan indicating the order and schedule for completion of the work and associated diversion provisions.
- B. The plan shall indicate the location of proposed diversion, pipe size and type, discharge locations, and the type and size of pumping equipment to be used.
- C. The plan shall describe contingencies to be used in the event of failure of the primary pumps.
- D. Contractor's diversion plan is subject to Owner's approval prior to implementation.

3.04 LAYING PIPE

- A. Install pipe in accordance with the SSSWC and ASTM specifications that pertain to the specified type of pipe material and the installation situation.
- B. Do not use pipe or fittings that are cracked or contain defects.
- C. Clean all pipe of any dirt and/or debris both inside and outside prior to placing in the trench.
- D. Make joints in accordance with manufacturer's directions with due care to avoid damaging pipe and/or disturbing previously laid pipe.
- E. Cut pipe only according to manufacturer's directions.
- F. Lay all sewer pipes to horizontal alignment and grade shown on the drawings with bell ends up hill. Establish and maintain horizontal alignment. Discrepancies from the required horizontal alignment or grade at any location shall not be greater than 0.10' or 0.05', respectively.

3.05 BEDDING/UTILITY COVER

- A. Provide *Crushed Stone Bedding* shall be used for both bedding and utility cover in accordance with the applicable requirements of CITY OF MADISON – Trenching.
- B. Where excavation extends below the bottom of the structure's base or the trench, bring the excavation to the required elevation by the use of compacted *Crushed Stone Bedding*.
- C. A minimum of 8" of compacted *Crushed Stone Bedding* shall be placed below manhole base.
- D. A minimum of 6" of compacted *Crushed Stone Bedding* shall be placed below the sanitary sewer pipe and 12" of cover material shall be placed over the sanitary sewer pipe (both measured at the bell of the pipe).

3.06 MANHOLES

- A. Manholes having improper location and/or orientation of the pipe connections will be rejected. Field repairs or adjustments of connection points are not permitted.
- B. Do not connect abandoned pipes to new manholes.
- C. Limit the excavation for manholes so as to provide only the necessary amount of space to sufficiently prepare the subgrade, set the base, set the manhole or structure, and lay pipe. Provide adequate clearance for compaction equipment and operator between structure and trench soil retention for adequate backfilling and compaction.
- D. Set manhole base in accordance with elevation and location as indicated on the drawings. Install base plumb and level. Install subsequent pre-cast manhole sections in accordance with shop drawing layout. Provide watertight gaskets between each manhole section.
- E. Pour inverts with smooth surface draining to downstream pipe. Where two or more lines meet at an angle, provide curved channel. Slope manhole bench at 2 inches/foot towards flow channel.
- F. Manholes shall be provided with between 4 inches and 8 inches of adjusting rings, with the top adjusting ring being 2" thick. Provide butyl sealant material between rings. Once rings are in place, tuck point the exterior joint and provide the entire exterior surface of the adjusting ring riser with a coating of mortar.
- G. When indicated on the drawings, the manhole frame shall be set with a Type I frame/chimney joint as specified in the Standard Specifications for Sewer and Water Construction in Wisconsin, latest edition. The frame and adjusting rings shall be sealed with an internal rubber sleeve as detailed in File 12A of the Standard Specifications.
- H. Drop manholes shall be constructed in accordance with the SSSWC.

3.07 CASTING INSTALLATION

- A. Install casting type as indicated on the drawings or in the specifications.
- B. Provide butyl sealant material between last adjusting ring and casting base. Adjust casting elevation and slope to match adjacent proposed grades.

3.08 CONNECTIONS TO EXISTING STRUCTURES

- A. Make all necessary openings into existing structures or sewers including the reconstruction of existing inverts or benches, as necessary. Patch all openings permanently watertight with hydraulic cement and flexible watertight boots.

3.09 SEWER LATERALS

- A. Connect existing sewer laterals in accordance with all of the requirements of the sewer mains, including bedding, backfill, compaction, and jointing of the pipe. Connect sewer laterals to the sewer main by means of an approved "wye" fitting. Connect the new pipe to the existing lateral material using a no-hub coupling or approved transition fitting. Coupling/fitting shall be selected for the specific pipe material being connected.
- B. Subject to local municipality requirements, cut-in type saddle wyes are permitted on existing sanitary sewers where service laterals are to be connected to the sewer. Unless otherwise indicated, the saddle fitting shall be gasketed PVC, with stainless steel bands and hardware.

3.10 PIPE INSULATION

- A. Provide board insulation where indicated on drawings or where depth of cover is less than 6 feet.
- B. Install insulation on compacted utility cover material, 6" above the top of the pipe. Stagger joints where more than one layer of insulation is required. Provide insulation with a minimum of 1' of utility cover material. Place cover and backfill material in manner that does not damage insulation; replace any damaged insulation.

3.11 TRACER WIRE

- A. Provide tracer wire for buried non-metallic sewer piping. Tracer wire shall be installed directly above the top of pipe and within six inches of the pipe.
- B. Splices in tracer wire shall be made with split-bolt or compression-type connectors.
- C. Access points are required every 400 feet or closer. At access points the tracer wire shall be brought to grade with manholes or other covered access devices.

3.12 LOCATOR TAPE

- A. Install locator tape directly above new non-metallic sanitary sewer pipe approximately 15 inches below finished grade. Bring tape to surface and terminate in valve box or other structure.

3.13 DEFLECTION TESTING

- A. Test all PVC sewer pipe in the presence of the Project Representative by a "go-no-go" deflection test mandrel furnished by the Contractor. Do not perform deflection testing any sooner than 30 days following the installation of the PVC pipe. Pull the mandrel by hand, or hand operated winch so as to avoid any damages to the pipe that may be caused by mechanized pulling equipment.
- B. Size the mandrel to test the pipeline for a maximum allowable internal deflection of the pipe (in any direction) of not to exceed five (5) percent of the original internal diameter for the pipelines tested, regardless of how long after installation the testing takes place.
- C. Deflection testing may be done concurrently with any necessary televising of the sewers. When done concurrently with sewer televising, the mandrel may be pulled by mechanized equipment, provided the mandrel is visible in the television picture during the testing and the operation of the mandrel can be quickly halted before damage to the pipe occurs.
- D. Where poor trench soils conditions require the pipe excavation to be undercut and/or over excavated, the Construction Representative reserves the right to require an additional deflection test prior to the expiration of the Contractor's one year performance guarantee.
- E. Remove and replace all pipe that fails to pass the five (5) percent vertical deflection testing until the pipe passes the deflection test.

3.14 LEAKAGE TESTING

- A. All new sanitary sewer lines shall be leakage tested in accordance with Chapter 3.7.0 of the SSSWC.

3.15 SEWER TELEVISIONING

- A. Upon completion of the sewer construction all new sewers shall be televised to provide a record of the actual conditions inside the newly constructed sewers via closed circuit televising equipment. The Project Representative may or may not be present during sewer inspections via this method.
- B. Utilize televising equipment with a color camera specially designed and equipped for the conditions of the sewers to be televised, and with a monitor screen.
- C. Transport the camera equipment through the sewers by means of mechanical or hand operated winches, coordinated to provide speed and directional control necessary to fully observe the sewer interior. Provide a light source for the necessary illumination.
- D. Provide televising equipment equipped with an on-screen distance meter, capable of registering distances in the sewer from the starting manhole, and accurate to the nearest 0.5' station, so as to facilitate in the locating of sewer features and/or defects from the ground surface.
- E. Provide televising equipment with an on-screen date and time clock, so as to permit the verification of the date and time of the television inspection.
- F. All video files of the sewer inspection shall contain audio notes describing the sewer location, direction of inspection, and a description of any pertinent features observed during the televised inspection (service locations, leaking or faulty joints, debris in the line, offset joints, etc.). In addition, record this information on a written log or record, in a format of the Contractor's choosing.
- G. The Contractor shall provide to the Project Representative with 2 DVD copies of the CCTV inspection videos and all inspection forms.

3.16 ABANDON SEWER

- A. Existing sewer that is no longer in service, but is left in place shall be abandoned in accordance with Section 3.2.24 of the SSSWC. Sewer shall not be abandoned until existing services have been reconnected to the replacement sewer.

END OF SECTION

**SECTION 33 30 00
SANITARY SEWERAGE UTILITIES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the sanitary sewer work required in these specifications and on the drawings. The limits of the work, including the responsible party for testing purposes, shall be clearly defined on the Drawings.

- B. All materials and methods shall meet the City of Madison public works standards 14 Articles 501 thru 509.

1.02 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 22 11 00 – Facility Water Distribution
- C. Section 22 13 00 – Facility Sanitary Sewerage

1.03 SUBMITTALS

- A. Provide manufacturers product information (cut sheets) and O&M information for watermain materials including:
 - 1. Pipe
 - 2. Fittings
 - 3. Valves
- B. Provide wastewater diversion and pumping plan.
- C. Provide reports documenting all required testing and televising. testing results for the project to the Project Representative and the AE within 48 hours of completing the individual tests.

1.04 REFERENCE DOCUMENTS

- A. Where reference is made to the “SSSWC”, it shall mean pertinent sections of the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition. Method of measurement and basis of payment sections in referenced documents shall not apply.
- B. Where these specifications do not cover portions of the work to be undertaken, the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition, shall govern the work.

1.05 REFERENCE STANDARDS

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D2235	Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D2564	Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2680	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3350	Standard Specifications for Polyethylene Plastic Pipe and Fittings Materials
ASTM D4673	Standard Classification System for Acrylonitrile-Butadiene-Styrene (ABS) Plastics and Alloys Molding and Extrusion Materials
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.06 AS-BUILD DRAWINGS

- A. Show the actual locations of watermain and services, valves and hydrants on drawings and show changes to proposed watermain size, alignment, or grades. Show the actual locations, sizes and types of underground utilities and other features encountered during construction.

PART 2 – MATERIALS

2.01 PVC PIPE

- A. Conform to ASTM D-3034 with solvent weld or elastomeric joints. Pipe shall be SDR-35, unless otherwise noted. Pipe over 15 inches in diameter shall meet the requirements of ASTM F679-03. Do not mix different manufacturer's products, or fittings.
- B. PVC fittings shall be same joint type and SDR as connecting PVC sanitary sewer pipe.

2.02 HDPE PIPE

- A. Polyethylene Resin
 - 1. Polyethylene resin used for manufacturing piping and fittings shall meet ASTM D1248 for Type III, Class C, Grade P34, Category 5, with a PPI recommended designation of PE3408 and a minimum cell classification of PE 345434C in accordance with ASTM D3350. The polyethylene compound shall be combined with carbon black to provide protection against degradation by ultraviolet light. Pipe shall be made from virgin material with no rework compound, except that obtained from the manufacturer’s own production of the same formulation.
- B. Polyethylene Piping
 - 1. High density polyethylene (HDPE) piping, shall meet the requirements of AWWA C906, current version. Pipe dimensions and workmanship shall be in accordance with ASTM F714 and ASTM D2122. Pipe shall be of diameter shown on the drawings, with dimension ratio (DR) of DR11, unless otherwise noted.
 - 2. Pipe, fittings, and joints shall meet or exceed the following physical properties:

<u>PROPERTY</u>	<u>ASTM TEST METHOD</u>	<u>VALUE</u>
Density, gm/cc	D1505	0.955
Melt Index, gm/10 min	D1238-E	0.10
High Load Melt Index, gm/10 min	D1238-F	12.0
Tensile Strength @ Break, psi	D638	4,500
Tensile Strength @ Yield, psi	D638	>3,200
Elongation, %	D638	>800
Flexural Modulus, psi	D790	136,000
Environmental Stress Cracking Resistance F ₂₀ , Hours (100°C)	D1693 (Cond. C)	>5,000
Brittleness Temperature, °F	D746	<-180
Melting Point, °F	D789	261
Vicat Softening Temperature, °F	D1525	255
Hardness, Shore D	D2240	66
Volume Resistivity, ohm-cm	D991	2.6 10 ¹⁶
Recommended Hydrostatic Design Stress:		1600 psi @ 73.4°F 800 psi @ 140°F

- C. Pipe Marking
 - 1. Each length of straight and special HDPE pipe and each HDPE fitting shall be plainly marked on the outside to identify the design pressure or class of pipe, proper location of the pipe or fitting in the pipeline, and the date of manufacture.

2.03 CONNECTIONS FOR DISSIMILAR PIPE MATERIALS

- A. Where new sewer connects to an existing dissimilar pipe, the connection shall be made with a no hub type coupling meeting the requirements of CISPI 310.
- B. Couplings shall have neoprene gaskets with stainless steel shield, and multiple stainless steel clamps with worm gear tightening device. The couplings shall be made specifically for the type and size of pipe materials being connected.
- C. Couplings shall be Fernco, Husky, or approved equal.

2.04 BOARD INSULATION

- A. Insulation shall be rigid, closed-cell extruded polystyrene insulation suitable for buried insulation. Individual boards shall have dimensions of 8'x4'x2".
- B. Owens Corning, Dow Styrofoam, or approved equal.

2.05 TRACER WIRE

- A. Tracer wire shall be #10 solid copper wire with green insulated jacket.

2.06 LOCATOR TAPE

- A. Tape shall be detectable metallic locator tape, specifically manufactured for marking utilities with a minimum width of 6 inches and detectable at a depth of 18".
- B. Tape shall be marked "SEWER" and green colored.

PART 3 – EXECUTION

3.01 GENERAL

- A. Complete exploratory excavations at utility crossings as shown on the drawings and as necessary to complete the work.
- B. Maintain clearances between watermains and existing or proposed sewer lines as follows:
 - 1. 8' horizontal separation (measured center to center) between watermains and existing or proposed sanitary or storm sewers.
 - 2. 12" vertical separation (measured from outsides of pipes) where watermains cross over sanitary or storm sewers.
 - 3. 18" vertical separation (measured from outsides of pipes) where watermains cross under sanitary or storm sewers.
- C. Notify the A/E and Project Representative of utility conflicts as soon as they are encountered.
- D. Store and handle pipe in accordance with manufacturers' recommendations. Keep pipes clean of soil, debris and animals.

3.02 DIVERTING SEWAGE

- A. Tributary buildings and services will remain occupied during construction.
- B. Wastewater will continue to be discharged to the sanitary sewers during construction.
- C. Contractor shall provide, operate and maintain all diversion and pumping equipment necessary to carry out the work and allow wastewater to continue to be discharged to the sanitary sewer system.
- D. Provide all necessary generators or other power source necessary to operate pumps on a continuous basis.
- E. Extra pumping and power equipment shall be staged onsite to maintain sewage diversion in the event of failure of the primary pumping equipment.
- F. The Contractor is solely responsible for sewage diversion.

3.03 DIVERSION PLAN

- A. Contractor shall provide a wastewater diversion and pumping plan indicating the order and schedule for completion of the work and associated diversion provisions.
- B. The plan shall indicate the location of proposed diversion, pipe size and type, discharge locations, and the type and size of pumping equipment to be used.
- C. The plan shall describe contingencies to be used in the event of failure of the primary pumps.
- D. Contractor's diversion plan is subject to Owner's approval prior to implementation.

3.04 LAYING PIPE

- A. Install pipe in accordance with the SSSWC and ASTM specifications that pertain to the specified type of pipe material and the installation situation.
- B. Do not use pipe or fittings that are cracked or contain defects.
- C. Clean all pipe of any dirt and/or debris both inside and outside prior to placing in the trench.
- D. Make joints in accordance with manufacturer's directions with due care to avoid damaging pipe and/or disturbing previously laid pipe.
- E. Cut pipe only according to manufacturer's directions.
- F. Lay all sewer pipes to horizontal alignment and grade shown on the drawings with bell ends up hill. Establish and maintain horizontal alignment. Discrepancies from the required horizontal alignment or grade at any location shall not be greater than 0.10' or 0.05', respectively.

3.05 BEDDING/UTILITY COVER

- A. Provide *Crushed Stone Bedding* shall be used for both bedding and utility cover in accordance with the applicable requirements of CITY OF MADISON – Trenching.
- B. Where excavation extends below the bottom of the structure's base or the trench, bring the excavation to the required elevation by the use of compacted *Crushed Stone Bedding*.
- C. A minimum of 8" of compacted *Crushed Stone Bedding* shall be placed below manhole base.
- D. A minimum of 6" of compacted *Crushed Stone Bedding* shall be placed below the sanitary sewer pipe and 12" of cover material shall be placed over the sanitary sewer pipe (both measured at the bell of the pipe).

3.06 MANHOLES

- A. Manholes having improper location and/or orientation of the pipe connections will be rejected. Field repairs or adjustments of connection points are not permitted.
- B. Do not connect abandoned pipes to new manholes.
- C. Limit the excavation for manholes so as to provide only the necessary amount of space to sufficiently prepare the subgrade, set the base, set the manhole or structure, and lay pipe. Provide adequate clearance for compaction equipment and operator between structure and trench soil retention for adequate backfilling and compaction.
- D. Set manhole base in accordance with elevation and location as indicated on the drawings. Install base plumb and level. Install subsequent pre-cast manhole sections in accordance with shop drawing layout. Provide watertight gaskets between each manhole section.
- E. Pour inverts with smooth surface draining to downstream pipe. Where two or more lines meet at an angle, provide curved channel. Slope manhole bench at 2 inches/foot towards flow channel.
- F. Manholes shall be provided with between 4 inches and 8 inches of adjusting rings, with the top adjusting ring being 2" thick. Provide butyl sealant material between rings. Once rings are in place, tuck point the exterior joint and provide the entire exterior surface of the adjusting ring riser with a coating of mortar.
- G. When indicated on the drawings, the manhole frame shall be set with a Type I frame/chimney joint as specified in the Standard Specifications for Sewer and Water Construction in Wisconsin, latest edition. The frame and adjusting rings shall be sealed with an internal rubber sleeve as detailed in File 12A of the Standard Specifications.
- H. Drop manholes shall be constructed in accordance with the SSSWC.

3.07 CASTING INSTALLATION

- A. Install casting type as indicated on the drawings or in the specifications.
- B. Provide butyl sealant material between last adjusting ring and casting base. Adjust casting elevation and slope to match adjacent proposed grades.

3.08 CONNECTIONS TO EXISTING STRUCTURES

- A. Make all necessary openings into existing structures or sewers including the reconstruction of existing inverts or benches, as necessary. Patch all openings permanently watertight with hydraulic cement and flexible watertight boots.

3.09 SEWER LATERALS

- A. Connect existing sewer laterals in accordance with all of the requirements of the sewer mains, including bedding, backfill, compaction, and jointing of the pipe. Connect sewer laterals to the sewer main by means of an approved "wye" fitting. Connect the new pipe to the existing lateral material using a no-hub coupling or approved transition fitting. Coupling/fitting shall be selected for the specific pipe material being connected.
- B. Subject to local municipality requirements, cut-in type saddle wyes are permitted on existing sanitary sewers where service laterals are to be connected to the sewer. Unless otherwise indicated, the saddle fitting shall be gasketed PVC, with stainless steel bands and hardware.

3.10 PIPE INSULATION

- A. Provide board insulation where indicated on drawings or where depth of cover is less than 6 feet.
- B. Install insulation on compacted utility cover material, 6" above the top of the pipe. Stagger joints where more than one layer of insulation is required. Provide insulation with a minimum of 1' of utility cover material. Place cover and backfill material in manner that does not damage insulation; replace any damaged insulation.

3.11 TRACER WIRE

- A. Provide tracer wire for buried non-metallic sewer piping. Tracer wire shall be installed directly above the top of pipe and within six inches of the pipe.
- B. Splices in tracer wire shall be made with split-bolt or compression-type connectors.
- C. Access points are required every 400 feet or closer. At access points the tracer wire shall be brought to grade with manholes or other covered access devices.

3.12 LOCATOR TAPE

- A. Install locator tape directly above new non-metallic sanitary sewer pipe approximately 15 inches below finished grade. Bring tape to surface and terminate in valve box or other structure.

3.13 DEFLECTION TESTING

- A. Test all PVC sewer pipe in the presence of the Project Representative by a "go-no-go" deflection test mandrel furnished by the Contractor. Do not perform deflection testing any sooner than 30 days following the installation of the PVC pipe. Pull the mandrel by hand, or hand operated winch so as to avoid any damages to the pipe that may be caused by mechanized pulling equipment.
- B. Size the mandrel to test the pipeline for a maximum allowable internal deflection of the pipe (in any direction) of not to exceed five (5) percent of the original internal diameter for the pipelines tested, regardless of how long after installation the testing takes place.
- C. Deflection testing may be done concurrently with any necessary televising of the sewers. When done concurrently with sewer televising, the mandrel may be pulled by mechanized equipment, provided the mandrel is visible in the television picture during the testing and the operation of the mandrel can be quickly halted before damage to the pipe occurs.
- D. Where poor trench soils conditions require the pipe excavation to be undercut and/or over excavated, the Construction Representative reserves the right to require an additional deflection test prior to the expiration of the Contractor's one year performance guarantee.
- E. Remove and replace all pipe that fails to pass the five (5) percent vertical deflection testing until the pipe passes the deflection test.

3.14 LEAKAGE TESTING

- A. All new sanitary sewer lines shall be leakage tested in accordance with Chapter 3.7.0 of the SSSWC.

3.15 SEWER TELEVISIONING

- A. Upon completion of the sewer construction all new sewers shall be televised to provide a record of the actual conditions inside the newly constructed sewers via closed circuit televising equipment. The Project Representative may or may not be present during sewer inspections via this method.
- B. Utilize televising equipment with a color camera specially designed and equipped for the conditions of the sewers to be televised, and with a monitor screen.
- C. Transport the camera equipment through the sewers by means of mechanical or hand operated winches, coordinated to provide speed and directional control necessary to fully observe the sewer interior. Provide a light source for the necessary illumination.
- D. Provide televising equipment equipped with an on-screen distance meter, capable of registering distances in the sewer from the starting manhole, and accurate to the nearest 0.5' station, so as to facilitate in the locating of sewer features and/or defects from the ground surface.
- E. Provide televising equipment with an on-screen date and time clock, so as to permit the verification of the date and time of the television inspection.
- F. All video files of the sewer inspection shall contain audio notes describing the sewer location, direction of inspection, and a description of any pertinent features observed during the televised inspection (service locations, leaking or faulty joints, debris in the line, offset joints, etc.). In addition, record this information on a written log or record, in a format of the Contractor's choosing.
- G. The Contractor shall provide to the Project Representative with 2 DVD copies of the CCTV inspection videos and all inspection forms.

3.16 ABANDON SEWER

- A. Existing sewer that is no longer in service, but is left in place shall be abandoned in accordance with Section 3.2.24 of the SSSWC. Sewer shall not be abandoned until existing services have been reconnected to the replacement sewer.

END OF SECTION