

**PARK EDGE/PARK RIDGE EMPLOYMENT CENTER
1233 MCKENNA BLVD.
MADISON, WISCONSIN 53719**

05.15.18

**FOR
CITY OF MADISON
CONTRACT 8213 MUNIS 10066**

By

**DORSCHNER|ASSOCIATES, INC.
849 EAST WASHINGTON AVENUE, SUITE 112
MADISON, WI 53703
608.204.0777**

**JDR ENGINEERING, INC.
5525 NOBEL DRIVE, SUITE 110
MADISON, WI 53711
608.277.1728**

**CZARNECKI ENGINEERING, INC.
1121 MARLIN COURT, SUITE B
WAUKESHA, WI 53186
262.513.2020**

**STRUCTURAL INTEGRITY, INC.
7702 TERRACE AVE., SUITE 1
MIDDLETON, WI 53562
608.833.8830**

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**SECTION 00 31 46
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11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

- 14 A. Each project has varying requirements for permits, inspections, and fees based on the scope, size, and location of
15 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. Paying all fees associated with the application of any required permits.
45 3. Scheduling all required inspections that may be conditions of any required permits.
46 B. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the
47 Contract Documents-Regulatory Documents Library on the Project Management Web Site.
48

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

50
51 **PART 3 – EXECUTION – THIS SECTION NOT USED**

52
53
54
55 **END OF SECTION**
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SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

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PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will not allow substitutions for specified Products except as follows:
20 1. The Product is no longer produced or the product manufacturer is no longer in business.
21 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
22 criteria for the specified Product(s).
23 3. Products specified by naming one or more Products or manufacturer’s and “or approved equal” or
24 “approved equivalent.”
25 C. The 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

- 33 A. Section 01 26 13 Request for Information (RFI)
34 B. Section 01 31 23 Project Management Web Site
35 C. Section 01 33 23 Submittals
36

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

- 40 A. During bidding all contractors (General and Sub-contractors) and suppliers of materials or products shall provide
41 hard copy of the Substitution Request form and all required attachments directly to the Project Architect.
42 Submission shall use the form located at the end of this specification.
43 1. Contractors and suppliers shall use the screen shot of the form located at the end of this specification to
44 print a hard copy for all pre-bid substitution requests.
45 B. After bidding only the GC shall submit a request and shall use the form located on the Project Management Web
46 Site.
47

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 50 A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the
51 substitution request deadline listed in the bidding documents. No substitution request will be considered during
52 the bidding period after the stated substitution request deadline. In general this procedure shall be as follows:
53 1. Submit the Substitution Request Form including all required supporting documentation to the City
54 Project Manager and Project Architect by the substitution request deadline specified in Section A of the
55 Contract Documents. Utilize the Substitution Request Form found at the end of this Section.
56 2. Submit a Substitution Request Form for each product, supported with complete data, drawings and
57 samples as appropriate, including:
58

- 1 i. Comparison of qualities of the proposed substitutions with that specified.
- 2 ii. Changes required in other elements of the Work because of the substitution.
- 3 iii. Effect on the construction schedule.
- 4 iv. Cost data comparing the proposed substitution with the Product specified.
- 5 v. Any required license fees or royalties.
- 6 vi. Availability of maintenance service and source of replacement materials.
- 7 3. The Owner and Architect will review the Substitution Request Form and if approved the City of Madison
- 8 will publish a bidding addendum authorizing the replacement. The Owner and Architect may reject any
- 9 substitution request without providing specific reasons.
- 10 B. Substitutions submitted and approved during the bidding phase shall be announced by the City of Madison by
- 11 addenda prior to the bid due date.
- 12

13 **3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT**

- 14 A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as
- 15 described in 1.1.B.1 and .2 above.
- 16 B. The GC shall submit a substitution request using the digital form on the Project Management Web Site located in
- 17 the Construction Administration-Substitution Request library.
- 18 1. Click on *Add document* to open a new digital form, fill out form, provide required attachments, then click
- 19 the Submit button.
- 20 2. Consulting Staff, Owner and Owners Representatives will review the request and provide the appropriate
- 21 approvals and feed back to the GC.
- 22

23 **3.3. UNAUTHORIZED SUBSTITUTIONS**

- 24 A. Any Contractor who substitutes products without proper authorization by the Owner and Architect will be
- 25 required to immediately remove and replace the product and all costs required to conform to the Contract
- 26 Documents shall be borne by the General Prime Contractor.
- 27
- 28
- 29

30 **END OF SECTION**

31



Substitution Request

Today's Date:

Project Title:

Project Number:

Contract Number:

Description	Spec Section	Page	Paragraph
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

The undersigned requests consideration of the following:

Proposed Substitution:

Attachments

[Click here to attach a file](#)

Insert item

- Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
- Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned General Contractor representative certifies that the following paragraphs are correct.

1. The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.
2. The proposed substitution does not affect dimensions shown on drawings.
3. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the request.
4. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
5. Maintenance and service parts will be locally available for the proposed substitution. Provide supporting documentation.

Submitted By:

****By typing my name and entering the date I hereby give my electronic signature****

Name: Title: Date:

Firm: Address:

Phone:

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2
3
4
5
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**SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)**

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14 3.4. COMMENCEMENT OF WORK RELATED TO AN RFI 2

15
16 **PART 1 – GENERAL**

17
18 **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 Construction Administration-Request for
22 Information Library on the Project Management Web Site (PMWS).
23

24 **1.2. RELATED SPECIFICATIONS**

- 25 A. Section 01 26 46 Construction Bulletin (CB)
26 B. Section 01 26 57 Change Order Request (COR)
27 C. Section 01 26 63 Change Order (CO)
28 D. Section 01 31 23 Project Management Web Site (PMWS)
29 E. Section 01 91 00 Commissioning
30

31 **1.3. PERFORMANCE REQUIREMENTS**

- 32 A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
33 1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.
34 B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one
35 RFI shall be allowed and responded to.
36

37 **1.4. QUALITY ASSURANCE**

- 38 A. The GC shall be responsible for all of the following:
39 1. Ensure that any request for additional information is valid and the information being requested is not
40 addressed in the construction documents.
41 2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
42 3. Ensure that all Work associated an RFI response is carried out as intended.
43 B. The PA shall be responsible for the following:
44 1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
45 a. The CPM, Owner, consulting staff, and other City staff shall be responsible for the initial review of
46 the RFI. The PA shall be responsible for codifying all consultant and Owner/City staff comments
47 into a unified RFI response.
48

49 **PART 2 – PRODUCTS**

50
51 **2.1. REQUEST FOR INFORMATION FORM**

- 52 A. The RFI form is located on the Project Management Web Site. The GC, PA, or CPM as appropriate shall click the
53 link in the left margin of the project web site opening a new form. Project information is pre-loaded, provide
54 additional information as indicated below in the execution to complete the form.
55

56 **PART 3 - EXECUTION**

1 **3.1. CONTRACTOR INITIATED RFI**

- 2 A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents
3 any contractor may initiate an RFI for additional information or clarification through the GC.
4 B. The GC shall select the "Submit an RFI" link on the Project Management Web Site and completely fill out the
5 form as follows:
6 1. Contract related information will be automatically populated on the form.
7 2. Thoroughly explain the issue at hand, provide backup information (photographs, sketches, drawings,
8 data, etc) as necessary, and clearly state the question or problem that requires a resolution. Combine
9 like or related issues but do not include multiple issues on one form.
10 a. Example. If a duct interferes with other critical piping and electrical work include all issues into
11 one RFI.
12 b. Example. If you have a question regarding the chiller and another regarding toilet partitions
13 create separate RFIs.
14 3. Check all relevant boxes for trades affected. This will assist the design team in determining who should
15 be reviewing the RFI.
16 C. Upon completing the RFI click the "Submit" button. The PMWS software will automatically route the RFI to the
17 appropriate reviewers.
18

19 **3.3. RFI RESPONSES**

- 20 A. Responses to simple RFI issues shall use the response section of the RFI form and shall be completed within five
21 (5) working days of the RFI form being submitted.
22 B. Responses to more complex issues may require additional time or may require a Construction Bulletin to be
23 published. The initial RFI shall be responded to within five (5) working days stating that the RFI is being
24 reviewed and provide an estimated date for the response.
25 C. The following GC generated RFIs will be returned without action:
26 1. Requests for approval of submittals
27 2. Requests for approval of substitutions
28 3. Requests for approval of Contractor's means and methods.
29 4. Requests for coordination information already indicated in the Contract Documents.
30 5. Requests for adjustments in the Contract Time or the Contract Sum.
31 6. Requests for interpretation of A/E's actions on submittals.
32 7. Incomplete RFI or inaccurately prepared RFI.
33

34 **3.4. COMMENCEMENT OF WORK RELATED TO AN RFI**

- 35 A. The GC shall only proceed with the Work of an RFI when additional information is not required.
36 B. The GC shall not proceed with any Work associated with an RFI while it is under review.
37 C. The GC shall not proceed with any Work associated with an RFI that clearly states a CB will be issued in response
38 to the RFI.
39 D. The GC will be required to immediately remove and replace unauthorized Work and all costs required to
40 conform to the Contract Documents shall be borne by the GC.
41
42
43

44 **END OF SECTION**
45
46

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

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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 Construction Administration-Construction Bulletin Library
32 on the Project Management Web Site (PMWS).
33

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
38 E. Section 01 91 00 Commissioning
39
40

1.3. PERFORMANCE REQUIREMENTS

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

1 **1.4. QUALITY ASSURANCE**

- 2 A. The PA shall be responsible for ensuring the final CB sufficiently provides direction, details, specifications and
3 other information as necessary for the GC to perform the intended Work.
4 B. The PA shall be responsible for ensuring the final CB is published as expeditiously as practical based on the
5 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. The PA shall click the link in the left margin of the
11 project web site opening a new form. Project information is pre-loaded, the PA only needs to enter information
12 and make attachments as needed to complete the form.
13

14 **PART 3 - EXECUTION**

15
16 **3.1. WRITING THE CONSTRUCTION BULLETIN**

- 17 A. The PA shall draft a CB as needed using the Construction Bulletin form on the Project Management Web Site.
18 1. The PA and/or consulting staff as necessary shall provide specifications, model numbers and performance
19 data, details and other such information necessary to clearly state the intentions of the CB.
20 2. The consulting staff, CPM, Owner, CxA and other City Staff shall review the draft and recommend
21 changes as needed.
22 3. The PA shall amend the draft as necessary into a final CB for review
23 B. Once the final CB has been approved the PA shall “Submit” the CB through the Project Management Web Site to
24 the GC.
25

26 **3.2. EXECUTING THE CONSTRUCTION BULLETIN**

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

37 **END OF SECTION**
38

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

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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 his 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 Construction Administration-Change Order Request
- 9 Library on the Project Management Web Site (PMWS).

10
11 **1.2. RELATED SPECIFICATION SECTIONS**

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

26
27 **1.3. DEFINITIONS AND STANDARDS**

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

- 1 2. DESIGN, ESTIMATING, AND SUPERVISION: All such efforts, unless specifically requested by Owner as
- 2 additional Work to be documented as a COR or portion thereof.
- 3 3. INSTALLATION LAYOUT: The layout required for the installation of material and equipment, and the
- 4 installation design, is the responsibility of the GC.
- 5 4. SMALL TOOLS AND SUPPLIES: The cost of small hand tools with an initial cost of \$1,500 or less, along
- 6 with consumable supplies and expendable items such as drill bits, saw blades, gasoline, lubricating or
- 7 cutting oil, and similar items.
- 8 5. GENERAL EXPENSE: The general expense, which is those items that are a specific job cost not associated
- 9 with direct labor and material such as job trailers, foreman truck, and similar items.
- 10 6. RECORD DRAWINGS: The preparation of record or as-built drawings.
- 11 7. OTHER COSTS: Any miscellaneous cost not directly assessable to the execution of the Change Order
- 12 including but not limited to the following:
- 13 a. All association dues, assessments, and similar items.
- 14 b. All education, training, and similar items.
- 15 c. All drafting and/or engineering, unless specifically requested by Owner as additional Work to be
- 16 documented as a Change Order proposal or portion thereof.
- 17 d. All other items including but not limited to review, coordination, estimating and expediting, field
- 18 and office supervision, administrative work, etc.
- 19 G. Contract Extension: The necessary amount of time to be added to the contract deadlines for the completion of a
- 20 change order.
- 21

22 **1.4. CONTRACT EXTENSION**

- 23 A. The GC shall not assume that every COR will require a Contract Extension. If the GC feels a contract extension is
- 24 warranted he/she shall provide sufficient scheduling information that shows how the COR being requested
- 25 impacts the critical path of the project.
- 26 B. The City of Madison strongly encourages the GC to explore alternative methods and practices prior to submitting
- 27 a COR with a request for contract extension.
- 28

29 **1.5. OVERHEAD AND PROFIT MARKUP**

- 30 A. Pursuant to the City of Madison Standard Specifications for Public Works Construction, Section 104.7, Extra
- 31 Work, the following maximum allowable markups shall be strictly enforced on all change orders associated with
- 32 the execution of this contract.
- 33 1. The total maximum overhead and profit shall not exceed fifteen percent (15%) of the total costs.
- 34 2. The total maximum overhead and profit shall be distributed as follows:
- 35 a. For work performed and materials provided solely by the General Contractor, fifteen percent
- 36 (15%) of the total costs.
- 37 b. For work performed and materials provided solely by Sub-contractors and supervised by the
- 38 General Contractor:
- 39 i. Supervision of the GC, five percent (5%) of the total Sub-contractor cost.
- 40 ii. Sub-contractors work and materials ten percent (10%) of the total Sub-contractor cost.
- 41

42 **1.6. PERFORMANCE REQUIREMENTS**

- 43 A. The GC shall become thoroughly familiar with this specification as it will identify procedures and expenses that
- 44 are or are not allowed under the Change Order and Change Order Request process.
- 45 B. The GC shall be responsible for all of the following:
- 46 1. Carefully reviewing the CB that is associated with the COR.
- 47 2. Collecting required supporting documentation from all contractors that quantify the need for a COR.
- 48 a. Labor hours and wage rates
- 49 b. Material costs
- 50 c. Equipment costs
- 51 C. The following shall apply to establishing prices for labor, materials, and equipment costs:
- 52 1. Where Work to be completed has previously been established by individual bid items in the contract bid
- 53 proposal the GC shall use the unit bid prices previously established.
- 54 2. Where Work to be completed was bid as a Lump Sum without individual bid items the GC shall provide a
- 55 breakdown of all labor, materials, equipment including unit rates and quantities required.
- 56 D. The completion date is determined by Owner. The schedule, however, is the responsibility of the GC. Time
- 57 extensions for extra Work will be considered when a schedule analysis of the critical path shows that the Change
- 58 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 (PA), Commissioning Agent (CxA), City Project Manager (CPM), other members of the
9 consulting staff, and city staff shall review all COR requests to ensure that the intent of the CB will be met under
10 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. The GC shall click the link in the left margin of
16 the project web site opening a new form. Follow additional instructions below in the execution section for filling
17 out the form.
18

19 **PART 3 - EXECUTION**

20
21 **3.1. ESTABLISHING A CHANGE ORDER REQUEST**

- 22 A. Upon receipt of a Construction Bulletin (CB) where the GC believes a significant change in contract scope
23 warrants the submittal of a COR the GC shall do all of the following within ten (10) working days after receipt of
24 the CB:
25 1. Review the CB with all necessary trades and sub-contractors required by the change in scope.
26 a. Additions or deletions to the contract scope shall be as directed within the CB.
27 b. Additions or deletions of labor and materials shall be determined by the GC based on the
28 directives of the CB.
29 2. Assemble all required back-up documentation for additions and deletions of materials, labor and other
30 related contract costs as previously outlined in this specification.
31 3. Submit a COR request form on the Project Management Web Site.
32 B. Submitting a COR does not obligate the GC to complete the work associated with the COR nor does it obligate
33 the Owner to approve the COR as a change to the contract.
34

35 **3.2. SUBMIT A CHANGE ORDER REQUEST FORM**

- 36 A. This specification shall provide a subject overview only. In depth instructions shall be provided to the awarded
37 Contractor in a PDF Instructional Manual.
38 B. The GC shall select the "Submit a COR" link on the Project Management Web Site.
39 C. The software will open a new COR form and the GC shall provide all of the following information:
40 1. DO NOT perform any calculations on this worksheet, only provide the raw data as requested below. All
41 calculations, totals, and markups shall be computed as described within this specification.
42 2. Provide a summary description of the COR request, and justification for any requested time extension to
43 the contract, indicate the number of calendar days being requested for the extension and add any
44 attachments to the form as needed.
45 3. Provide all GC self performance data including all of the following:
46 a. Materials description, quantities, and unit costs.
47 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
48 c. Equipment descriptions, quantities, unit costs and rates.
49 4. Provide all Sub-contractor data including all of the following:
50 a. Materials description, quantities, and unit costs.
51 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
52 c. Equipment descriptions, quantities, unit costs and rates.
53 5. Ensure all calculations performed by the form have been completed correctly. Contact the CPM directly
54 if you suspect an error before hitting the save button.
55 C. At any time after creating a COR you must at a minimum click "Save as Draft" to save your work.
56 D. When all data has been entered and verified click on the "Submit COR" button. This will kick off the COR Review
57 and Approval process.
58

1 **3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING**

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

15
16 **3.4. EMERGENCY CHANGE ORDER REQUEST**

- 17 A. In the event Work is required due to an emergency as described in the Contract Documents, the GC must
18 request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
19 commencement of such emergency.
20 B. The GC shall provide full documentation of all labor, materials and equipment used during the period of
21 emergency as part of the COR submittal.
22
23
24

25 **END OF SECTION**
26

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

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13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
18 by the General Contractor (GC) without having prior approval of the City Project Manager (CPM).
19 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
20 the Work by written Change Order. Such changes may include additions and/or deletions.
21 C. The Change Order (CO) is a Board of Public Works (BPW) form that is reviewed and approved by a specific
22 process.
23 D. The CO form is typically made up of multiple Change Order Requests (CORs) and/or Bid Items as appropriate
24 depending on the type of project and how the contract was bid.
25 E. All CO documentation shall be processed through the Construction Administration-Change Order Library and
26 digital workflow on the Project Management Web Site (PMWS).
27

1.2. RELATED SPECIFICATION SECTIONS

- 28
29 A. Section 01 26 13 Request for Information (RFI)
30 B. Section 01 26 46 Construction Bulletin (CB)
31 C. Section 01 26 63 Change Order Request (COR)
32 D. Section 01 31 23 Project Management Web Site
33 E. Section 01 91 00 Commissioning
34

1.3. BOARD OF PUBLIC WORKS PROCEDURE

- 35
36 A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders
37 associated with any Public Works Contract as follows:
38 1. The Supervisory Chain of the CPM shall review and approve any CO under \$10,000 provided it does not
39 include either of the following:
40 a. The CO does not request a time extension to the contract.
41 b. The CO does not cause the contract contingency sum to be exceeded.
42 2. The Board of Public Works shall review and approve any CO that requires any of the following:
43 a. Any CO over \$10,000.
44 b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
45 c. Any CO that that causes the contract contingency sum to be exceeded.
46 B. The Board of Public Works generally meets every other week and only once in August and December. The GC is
47 cautioned that, under normal scheduling, a CO requiring a BPW review will take a minimum of two (2) weeks to
48 achieve final approval.
49 1. The City shall not be responsible for additional delays to the Work caused by the scheduling constraints
50 of the Board of Public Works.
51 C. **SPECIAL NOTE:** The GC is cautioned to never proceed unless told to do so by the CPM. Only in rare instances
52 may the CPM give a written notice to proceed on a COR without an approved CO. Proceeding without the
53 written notice of the CPM or an approved CO is at the GC's own risk.
54

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 Construction Administration-Change Order Library on the
12 Project Management Web Site as follows:
13 1. Provide information for all contract information.
14 2. Provide a general description of the items described within the change order.
15 3. Provide detailed information for each Item on the CO form. At the option of the CPM he/she may include
16 multiple Change Order Requests each as their own item.
17 4. Provide required pricing and accounting information as needed for the item.
18 5. Insert attachments of contractor/architect provided information that clarifies and quantifies the CO.
19 Attachments may include but not be limited to material lists, estimated labor, revised details or
20 specifications, and other documents that may be related to the requested change.
21 6. Save the final version of the completed CO.
22

23 **3.2. EXECUTION OF THE CHANGE ORDER**

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

48 **END OF SECTION**
49

SECTION 01 29 73
SCHEDULE OF VALUES

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15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The Schedule of Values (SOV) is a Contractor provided statement that allocates portions of the total contract
20 sum to various portions of the contracted work and shall be the basis for reviewing the Contractors Progress
21 Payment Requests.
22 B. AIA Document G702 – Application and Certificate for Payment and AIA Document G703 Continuation Sheet shall
23 be filled out in sufficient detail to be used as a guideline in determining work completed and materials stored on
24 site when verifying Progress Payment Requests.
25 C. The General Contractor shall be responsible for filling out, updating, and providing these work sheets with each
26 Progress Payment Request.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 76 Progress Payment Procedures
31 C. Section 01 31 23 Project Management Web Site
32 D. Section 01 32 26 Construction Progress Reporting
33 E. Section 01 33 23 Submittals
34 F. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard 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 Standard Specification 210.2” click the link for Part II, the Part II
40 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

1.3. RELATED DOCUMENTS

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

1
2 **1.4. BASIS OF VALUES**

- 3 A. The Contractor shall provide a breakdown of the Contract Sum in sufficient detail to assist the Architect and City
4 Project Manager in evaluating Progress Payment Requests. The breakdown detail may require a labor and
5 material breakdown for each division of work or trade or as directed by the CPM.
6 B. The total sum of all items shall equal the Contract Sum.
7

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

9
10 **PART 3 - EXECUTION**

11
12 **3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT**

- 13 A. The Contractor shall use AIA Document G-702 Application and Certificate for Payment with each Progress
14 Payment Request.
15 B. Completely fill out the Project Information section as follows:
16 1. TO OWNER; provide all owner related information as provided in the contract documents.
17 2. PROJECT; provide all contract information including contract number, title and address.
18 3. FROM CONTRACTOR; provide all contractor related information.
19 4. VIA ARCHITECT; provide all the architect's related information including the architect's project reference
20 number if different from the owners.
21 5. Indicate the current APPLICATION NO., PERIOD TO date, and CONTRACT DATE.
22 C. Completely fill out the Contractors Application for Payment section.
23 1. Fill out lines 1 through 9 to reflect the current status of the contract through the payment date being
24 requested.
25 2. The City of Madison calculates retainage on Public Works Contracts as follows:
26 a. In general, across the duration of the contract, 2.5% of the total contract sum, including change
27 orders, is withheld for retainage as referenced from the City of Madison Standard Specification
28 110.2:
29 i. Beginning with Progress Payment 1, 5% retainage will be withheld until such time that 50%
30 of the total contract sum has been paid out.
31 ii. No additional retainage will be withheld after 50% of the total contract sum has been paid,
32 unless additional change orders have been approved after the 50% milestone has been
33 reached. Per City of Madison Standard Specification 110.2, additional retainage up to 10%,
34 may be held in the event there are holds placed by Affirmative Action or liquidated
35 damages by BPW.
36 iii. Retainage for additional change orders after the 50% milestone will be withheld at the rate
37 of 2.5% of the total cost of the change order.
38 iv. Retainage is based on the change orders posted to the City's contract worksheet at the
39 time the progress payment is processed.
40 D. Completely fill out the Change Order Summary section. Only change orders that have been finalized and posted
41 to the City of Madison's Application for Partial Payment worksheet may be itemized into the SOV documents.
42 E. The Contractor shall sign and date the application and it shall be properly notarized.
43 F. The Contractor shall not fill in any information in the Architects Certificate for Payment section.
44

45 **3.2. AIA DOCUMENT G703 – CONTINUATION SHEET**

- 46 A. The Contractor shall use AIA Document G-703 Continuation Sheet to itemize his/her SOV for this contract.
47 Provide additional sheets as necessary.
48 B. Provide information in Column A (Item No.), Column B (Description of Work), and Column C (Scheduled Value) by
49 any method that allocates portions of the total contract sum to various portions of the contracted work.
50 Possible methods include combinations of the following:
51 1. By division of work
52 2. By contractor, sub-contractor, sub sub-contractor
53 3. By specialty item or group
54 4. Other methods of breakdown as may be requested by the City Project Manager or City Construction
55 Manager at the pre-construction meeting.
56 C. Provide total cost of the item/description of work including proportionate shares of profit and overhead related
57 to the item.
58

1 **3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL**

- 2 A. The Contractor shall upload his/her initial SOV to the Project Management Web Site, Submittals Library, no later
3 than five (5) working days after the Pre-construction Meeting.
4 1. The initial SOV shall provide information in Column A (Item No.), Column B (Description of Work), and
5 Column C (Scheduled Value) only.
6 2. The level of detail shall be as described in section 3.2 above.
7 B. The Project Architect (PA) and the City Project Manager (CPM) shall review the SOV as any other submittal and
8 may require modifications to reflect additional detail as necessary.
9 C. The Contractor shall resubmit the SOV as necessary until such time as the PPA and CPM have sufficient detail for
10 assessing and approving future Progress Payment Applications.
11 D. Progress Payment Application 1 will not be processed until such time as the Contractor has met this requirement
12 regardless of the amount of work completed per the application.
13

14 **3.4. SOV FOR PROGRESS PAYMENT REQUESTS**

- 15 A. The Contractor shall update the initial SOV with each Progress Payment Application as follows:
16 1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of
17 Values submittal has been approved.
18 2. Change orders shall be added as additional items and values at the bottom of the SOV as they become
19 approved and posted to the City's contract worksheet. The value for each change order shall be the
20 value indicated on the SOV and shall stand alone. Values shall not be split out or combined with other
21 existing items with similar work descriptions on the original SOV.
22 3. Fill out Columns D, E, F and G to properly reflect the work completed and materials received since the last
23 Progress Payment Application.
24 4. Only materials delivered and stored on the project site may be reflected on SOV progress updates.
25 B. Provide updated G702 and G703 sheets with each Progress Payment application.
26 C. See Specification 01 29 76 Progress Payment Procedures for additional information on submitting Progress
27 Payment Applications.
28
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31 **END OF SECTION**
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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

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10 PART 2 - PRODUCTS - THIS SECTION NOT USED 4
11 PART 3 - EXECUTION 4
12 3.1. GENERAL CONTRACTOR PROCEDURE 4
13 3.2. PROJECT ARCHITECT PROCEDURE 5
14 3.3. CITY PROJECT MANAGER PROCEDURE 5
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The General Contractor (GC) shall review this and all related specifications prior to submitting progress payment
20 requests.
21 B. Progress payment requests (Partial Payment-PP) for this contract shall be uploaded digitally by the GC to the
22 Project Management Web Site
23 C. The Project Architect (PA) and City Project Manager (CPM) shall review and amend or approve the PP on the
24 Project Management Web Site.
25 D. After approval of the PP by the CPM, he/she shall forward the PP to the appropriate agencies for BPW
26 contractual review and payment processing.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 73 Schedule of Values
31 C. Section 01 31 19 Progress Meetings
32 D. Section 01 31 23 Project Management Web Site
33 E. Section 01 32 16 Construction Progress Schedules
34 F. Section 01 32 26 Construction Progress Reporting
35 G. Section 01 33 23 Submittals
36 H. Section 01 45 16 Field Quality Control Procedures
37 I. Section 01 77 00 Closeout Procedures
38 J. Section 01 78 13 Completion and Correction List
39 K. Section 01 78 23 Operation and Maintenance Data
40 L. Section 01 78 36 Warranties
41 M. Section 01 78 39 As-Built Drawings
42 N. Section 01 78 43 Spare Parts and Extra Materials
43 O. Section 01 79 00 Demonstration and Training
44

1.3. RELATED DOCUMENTS

- 46 A. The following documents shall be used when evaluating PP requests.
47 1. Daily and weekly construction progress reports filed since the last payment request.
48 2. Contractors Schedule of Values as updated from the last payment request. See Specification 01 29 73.
49 3. Any document that may be required to be submitted for review and approval, as noted by the
50 specifications listed in Section 1.2 above, or the Progress Payment Milestone Schedule in Section 1.4
51 below, to achieve a required bench mark of contract progression or contract requirement.
52

1.4. PROGRESS PAYMENT MILESTONES

- 54 A. City Engineering-Facility Management has developed the Project Payment Milestone Schedule (Section 1.4
55 below) to assist the GC in providing required construction specific documentation and general contractual
56 documentation in a timely manner.
57 B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment
58 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 his/her option may
7 elect 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 • 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
Required Construction Submittals/Administrative Documents <ul style="list-style-type: none"> • Contractors Project Directory • Schedule of Values • Submittals Schedule • Waste Management Plan • Closeout Requirement Checklist • Warranty Checklist 	PP-1	References <ul style="list-style-type: none"> • Specification 01 31 23 • Specification 01 29 73 • Specification 01 32 19 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 36
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		
BPW Contract Administration Documentation <ul style="list-style-type: none"> • Weekly payroll reports • Best Value Contracting 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>

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
<ul style="list-style-type: none"> 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 All BPW contractual requirements are verified 	Final	<ul style="list-style-type: none"> Specification 01 77 00 Contractor must provide any missing BPW Contractual Documentation
* Completion of this closes the contract but not the warranty period/bond.		

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

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1.5. PROGRESS PAYMENT SUBMITTAL

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

PART 2 - PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR PROCEDURE

- A. The GC shall provide an updated version of his/her schedule of values (AIA documents G702 & G 703) with each PP request.
 - 1. The AIA - Application and Certificate for Payment (G702) shall be properly filled out and prepared for the Architects review. See specification 01 29 73, Schedule of Values for more information.
 - 2. The AIA - Continuation sheets (G703) shall be properly filled out and indicate the dollar value of the completed work to date for each item on the form. See specification 01 29 73, Schedule of Values for more information.
 - a. The GC shall subtotal the work completed to date for all of the original Schedule of Value items.
 - b. Divide the sub total of work completed by the Original Contract Total to obtain a percentage complete of the original Lump Sum Bid. This percentage may be taken out to five (5) decimal places (round fifth place up or down as needed).
 - i. Example: \$5,192.55 of completed work divided by \$10,000 original Contract Total = 0.519255, round this to 0.51926
 - c. Write the percentage in Column 10 on the City Tabular Sheet for the original lump sum bid item in RED ink.
 - 3. Ensure that any newly posted change orders from the City of Madison provided tabulation sheet have been entered on the G703 continuation sheets. Repeat steps a thru c above for each change order on the schedule of values and the City Tabular Sheet.
- B. The GC shall fill out the City of Madison Application and Certificate of Payment cover sheet as follows:
 - 1. The GC shall not change any pre-printed information and shall not write in the box that indicates previous progress payments.
 - 2. The GC shall sign and date the form where indicated.
 - 3. The GC shall provide the dates from and to for the PP being requested.

- 1 4. The GC shall provide the list of all contractors/sub-contractors that were actively working during the
2 dates indicated above.
3 a. All contractors/sub-contractors named must be in compliance with all City requirements (Pre-
4 qualified, Affirmative Action Plan on file, etc). The PP will be held and not processed by the City of
5 Madison until all contractors/sub-contractors are in compliance.
6 b. Do not list the names of suppliers or manufacturers, doing so will slow down processing and
7 require a re-submittal of the paperwork.
8 C. The General Contractor (GC) shall scan all of the documents listed below in the order shown, save the scan as a
9 single PDF file for each PP request.
10 1. City cover sheet – Application and Certificate for Payment
11 2. City tabulation sheet(s)
12 3. AIA G702 - Application and Certificate for Payment
13 4. AIA G703 - Continuation Sheet(s)
14 5. Any miscellaneous documents that may be requested as backup documentation for the pay request.
15 a. Lien waivers are not required and shall not be submitted.
16 b. Do not provide contractual administrative documents such as pay reports with pay requests.
17 c. Do not supply progress deliverables with pay requests.
18 F. Upload the pay request PDF to the Contract Documents-GC Partial Pay Apps library on the Project Management
19 Web Site.
20

21 **3.2. PROJECT ARCHITECT PROCEDURE**

- 22 A. The PA shall review the AIA-continuation sheets provided by the GC to determine if the Schedule of Values
23 accurately reflects the work completed for the inclusive dates indicated.
24 B. The PA shall advise the CPM of any discrepancies in the schedule of values.
25 C. The PA shall work with the GC and the CPM to resolve any issues prior to signing the AIA - Application and
26 Certificate for Payment.
27 D. When verified, the PA shall digitally sign the original PDF version of the AIA - Application and Certificate for
28 Payment on the Project Management Web Site.
29

30 **3.3. CITY PROJECT MANAGER PROCEDURE**

- 31 A. The CPM shall review all documents submitted by the GC and work with the PA to ensure the schedule of values
32 accurately reflects the work completed to date.
33 B. The CPM may elect to hold processing of any progress payment pending submittal of required progress payment
34 milestones.
35 C. When verified, the CPM shall digitally sign the City Cover Sheet and forward the required documentation to the
36 appropriate City agencies for further processing of the payment request.
37 D. The CPM shall add a scanned copy of any documents indicating the PP request processing was completed to the
38 PMWS.
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41 **END OF SECTION**
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**SECTION 01 31 13
PROJECT COORDINATION**

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8 1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS 2
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10 PART 2 – PRODUCTS – THIS SECTION NOT USED 3
11 PART 3 – EXECUTION – THIS SECTION NOT USED 3
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

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

- 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

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**SECTION 01 31 19
PROJECT MEETINGS**

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8 1.4. GENERAL REQUIREMENTS 1
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10 PART 3 - EXECUTION 1
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12 3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING 2
13 3.3. CONSTRUCTION PROGRESS MEETINGS 2
14 3.4. PRE-INSTALLATION MEETINGS 3
15 3.6 PRE-CONTRACT CLOSEOUT MEETINGS 3
16 3.7 OTHER SPECIAL MEETINGS 3
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 his/her 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
32

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
42

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

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- A. The CPM shall schedule and conduct a tutorial presentation of the PMWS prior to the beginning of construction.
 - B. The CPM shall be responsible for the final agenda, there will be no minutes.
 - C. The required attendance list in 3.1.D. above shall apply except for City Staff in items 1 and 4 who are already familiar with the PMWS system.
 - D. It is recommended that all contractors bring their lap top, tablet or other internet capable device with them including a fully charged battery and internet connection devices as necessary.

3.3. CONSTRUCTION PROGRESS MEETINGS

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- 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.

1 8. The above requirements do not apply to GC/sub-contractor meetings.
2

3 **3.4. PRE-INSTALLATION MEETINGS**

- 4 A. The GCPM shall schedule and conduct all pre-installation meetings, including mockup reviews, before each
5 construction activity that requires coordination with other trades.
6 B. The GCPM shall be responsible for the final agenda and meeting minutes.
7 C. The GCPM will work with all concerned parties to resolve issues as needed and submit RFI's if necessary.
8 D. Required attendance shall be from the list in 3.1.D. above and shall be personnel having a stake in the outcome
9 of the installation or knowledge of the system being installed.
10 E. In the event the Contractor installs equipment or materials without a pre-installation meeting the Contractor
11 shall be solely responsible for removing, replacing, repositioning materials and equipment as instructed by the
12 Project Architect or City Project Manager at no additional cost to the City.
13

14 **3.6 PRE-CONTRACT CLOSEOUT MEETINGS**

- 15 A. Two (2) Pre-contract Closeout Meetings shall be held to review the closeout procedures, requirements, and
16 contract deliverables.
17 1. Pre-contract Closeout Meeting #1 shall be scheduled prior to the 50% Progress Payment Request is being
18 requested. This meeting shall discuss items such as closing out QMO reports, providing O&M drafts and
19 finals, payroll and Affirmative Action documentation, and other contract deliverables.
20 2. Pre-contract Closeout Meeting #2 shall be scheduled prior to the 80% Progress Payment Request is being
21 requested. This meeting shall discuss, but not be limited to, the status of scheduling final regulatory
22 inspections, cleaning up outstanding QMO's, demonstration and training, attic stock; and finalization
23 review of payroll and other related documents.
24 B. The GCPM shall schedule, coordinate, and make physical arrangements for both meetings.
25 C. All of the following shall be required to attend both meetings:
26 1. The GCPM and the GC Field superintendent
27 2. All Subcontractor Project Managers regardless of the current status of their work.
28 a. The GCPM may excuse a Subcontractor PM if he is confident that all contractual requirements for
29 closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of
30 attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
31 b. At the option of these project managers the field supervisors may also attend.
32 3. The Project Architect and at least one design consultant from each discipline represented by the plans
33 and specifications to address open QMOs, final tests, reports, etc.
34 4. The Owner
35 5. The CPM
36 6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
37 7. The Commissioning Agent
38 D. The CPM shall publish an agenda and chair the meeting.
39

40 **3.7 OTHER SPECIAL MEETINGS**

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

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

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PART 1 – GENERAL 1
 1.1. GENERAL DESCRIPTION 1
 1.2. SHAREPOINT PROCEDURE OVERVIEW 1
 1.3. RELATED SPECIFICATIONS 2
 PART 2 - PRODUCTS 2
 2.1. SHAREPOINT SYSTEM RELATED PRODUCTS 2
 PART 3 - EXECUTION 2
 3.1. POST BID-OPENING 2
 3.2. POST PRE-CONSTRUCTION MEETING 3

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

- A. The City of Madison (CoM) has established a web based Project Management Tool (PMT) using a Microsoft product called SharePoint (SP).
- B. The software is used throughout the design, construction and warranty process of major remodels and new construction projects executed as a City of Madison, Board of Public Works project.
- C. Initially deployed in mid 2013, the PMT software has been successfully deployed on several projects, and we continue to modify/update/enhance the PMT on a regular basis.

1.2. SHAREPOINT PROCEDURE OVERVIEW

- A. The CoM PMT is a system of consolidated Document & Form Libraries and Data Lists that assist in performing day to day functions of design/construction management while reducing the use of surface mail, email and email attachments.
 - 1. Document libraries store a wide variety of documents in many different formats including but not limited to Word, Excel, PDF, photographs (all popular formats), etc.
 - 2. Data Lists contain consolidated data information that can be generated and stored for further use. Punch Lists and Warranty issues will be examples of Data Lists.
 - 3. Form libraries contain snapshot information associated with a particular Data Entry form. An example of this is the Quality Management Observation form.
- B. The following libraries and sub-libraries on the PMWS are provided for specific workflows and contract documentation. Related specification numbers are in "()" if applicable.

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

- 1
2 C. A tutorial document on the web based PMT will be provided to the General Contractor (GC) who is awarded the
3 contract. Additional training will be provided as needed for the GC and Sub-Contractors (SC) by the CoM.
4 D. The PMT has predefined work flows that channel automated alerts as documents are uploaded, reviewed, and
5 completed. These workflows are designed for inbound information from the contractor as well as outbound
6 information from the Architectural/Engineer consultant and the Owner.
7 E. The GC will be required to receive email notifications, access the internet to review related documentation and
8 be able to upload/download documentation to the various project libraries.
9 F. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related
10 documentation. Prior to setting up the final PMT the GC and CPM shall meet to review all SP workflows, the GC
11 will determine to what level over the minimum requirements the SC's will be involved.
12

13 1.3. RELATED SPECIFICATIONS

- 14 A. The following specification sections are directly related to the CoM PMT system.
15 1. 01 26 13 Request for Information (RFI)
16 2. 01 26 46 Construction Bulletins (CB)
17 3. 01 26 57 Change Order Request (COR)
18 4. 01 26 63 Change Order (CO)
19 5. 01 29 76 Progress Payment Procedures
20 6. 01 31 19 Project Meetings
21 7. 01 32 16 Construction Progress Schedules
22 8. 01 32 26 Construction Progress Reporting
23 9. 01 32 33 Photographic Documentation
24 10. 01 33 23 Submittals
25 11. 01 45 16 Field Quality Control Procedures (Owner)
26

27 PART 2 - PRODUCTS

28 2.1. SHAREPOINT SYSTEM RELATED PRODUCTS

- 29 A. SharePoint is a Microsoft Windows based software that requires no additional software installation, hardware or
30 other special requirements/applications for the users. There are no costs associated with the use of this system.
31 B. Currently the CoM is using SharePoint 2010.
32 1. SharePoint works best if the user's computer is running Windows versions 7 through 8.1.
33 2. SharePoint works best when used with Internet Explorer versions 7, 8 and 9 (32 bit).
34 a. At this time SharePoint is not fully supported by Internet Explorer versions 10 and 11.
35 b. At this time SharePoint is not entirely compatible with other internet browsers such as Fire Fox,
36 Google Chrome, and Safari.
37
38

39 PART 3 - EXECUTION

40 3.1. POST BID-OPENING

- 41 A. After bids have been opened, a successful bidder has been determined, and bid acceptance procedures have
42 been initiated the City Project Manager (CPM) will contact the GC to provide the following information.
43 1. Project Management Software Tutorial. This tutorial is in a PDF printable format with screen shots and
44 associated instructions on how to access and use the PMT.
45 a. Tutorial instructions will include but not be limited to the following:
46 i. Descriptions of various libraries, documents, and forms that will be used throughout the
47 construction project.
48 ii. Uploading procedures for various types of documents including standardized naming
49 conventions.
50 2. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following
51 information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project
52 Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
53 a. Last Name, First Name
54 b. Company Name
55 c. Email address (valid, work related)
56 d. Work Phone Number (required, include area code)
57 e. Cell Phone Number (not required, include area code)
58

- 1 3. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
- 2 4. The GC may provide project foreperson information for work being self performed if he/she so desires.
- 3

4 **3.2. POST PRE-CONSTRUCTION MEETING**

- 5 A. The GCPM will return the completed Project Directory spread sheet to the CPM no later than the Pre-
6 construction meeting.
- 7 B. The CPM is responsible for uploading all project directory data into SharePoint and coordinating with CoM
8 Information Technology (CoM-IT) for creating the logins and passwords of non-city staff (GC/SC staffs).
- 9 C. All GC/SC staff will be notified through an automated email from CoM IT that logins and passwords are available.
10 It is the responsibility of each GC/SC to call the CoM-IT number provided in the email to receive his/her
11 login/password over the phone. Logins and passwords will not be released via email.
- 12 D. Once the GCPM has received his/her login/password uploading of contract related documents can begin. This
13 would include but not be limited to project schedules, submittals, RFI's, and other documents as needed.
- 14 E. All workflows, review of documentation, and general archiving of construction related documentation will be
15 conducted on the PMWS. These documents will generally not be emailed.
- 16 F. The following documents related to the execution of the contract will not be part of the PMWS:
 - 17 1. All documentation related to executing the contract, such as:
 - 18 a. Sub Contractors list
 - 19 b. Affirmative Action documentation
 - 20 c. Bonding documentation
 - 21 d. Documentation associated with payroll verification
 - 22 e. Final documentation associated with closing out the contract
 - 23 2. Any documentation required/generated by ordinance, code or statute, such as;
 - 24 a. Erosion Control inspections
 - 25 b. Building Inspection Department inspections
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END OF SECTION

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**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES**

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4 PART 1 – GENERAL 1
5 1.1. SCOPE 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS – THIS SECTION NOT USED 1
8 PART 3 - EXECUTION 1
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

16
17 **END OF SECTION**
18

**SECTION 01 32 19
SUBMITTALS SCHEDULE**

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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. SUBMITTAL DEFINITIONS 1
9 1.5. SUBMITTAL REQUIREMENTS 2
10 1.6. ADMINISTRATIVE SUBMITTALS 2
11 PART 2 – PRODUCTS – THIS SECTION NOT USED 2
12 PART 3 - EXECUTION 2
13 3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS 2
14 3.2. GENERAL CONTRACTORS RESPONSIBILITIES 2
15 3.3. STAFF REVIEW RESPONSIBILITIES 3
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
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

1.5. SUBMITTAL REQUIREMENTS

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

1.6. ADMINISTRATIVE SUBMITTALS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS

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

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

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

- A. The General Contractor shall be responsible for all of the following:
 - 1. Consolidating all submittal lists from individual contractors into one master list.
 - 2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet with individual contractors to make changes as necessary.
 - 3. Upload the completed Submittals Schedule to the Submittal Library on the Project Management Web Site for review as SD 003.0. See Specification 01 33 23 Submittals for more information on this procedure.
 - 4. Resubmit the schedule as needed after initial reviews have been completed.
- B. The GC shall work with other contractors to amend the Submittals Schedule throughout the execution of the project based on changes and modifications as needed.
- C. The GC and Project Architect shall be responsible for reviewing and briefing the submittal schedule and submittals status at each bi-weekly construction meeting.

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3.3. STAFF REVIEW RESPONSIBILITIES

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

END OF SECTION

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**SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING**

1
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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS 1
8 PART 2 – PRODUCTS - THIS SECTION NOT USED 1
9 PART 3 - EXECUTION 1
10 3.1. DAILY PROGRESS JOURNAL 1
11 3.2. CONSTRUCTION PROGRESS MEETINGS 2
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
24

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 his/her choosing provided it is legible and contains
29 the 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.
32

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. DAILY PROGRESS JOURNAL

- 38 A. The GC shall maintain a daily progress journal of daily Work activities for each day on which Work is performed
39 by any employee or entity for which the GC is responsible. Such reports shall include all relevant data
40 concerning the progress of Work activities the GC and Subcontractors are responsible for and the effect of that
41 activity on the time of performance of the Contract.
42 B. Journal entries shall be made on the Daily Work Report Form located in the Construction Progress-Daily Journal
43 Library on the Project Management Web Site. The form consists of the following areas:
44 1. Weather; include temperature, humidity, precipitation, wind and other related information such as
45 significant storm events, times, and details.
46 2. Work completed by trade
47 3. Delays encountered
48 4. Deliveries received or delayed
49 5. Hot issues that need to be addressed
50 6. Safety issues
51 7. Photograph progress and upload to the Photo Library on the Project Management Web Site.
52 8. Other including inspections, testing, etc.
53 9. Space for attaching documents
54 C. Daily Work activity reports shall be completed and signed by the GC's Job Superintendent or other on-site
55 representative authorized by the GC confirming each such report is current, accurate and complete.
56 D. If applicable the GC shall include schedules of quantities and costs, progress schedules, wage rates, reports,
57 estimates, invoices, records and other data as requested by the CPM concerning Work performed or to be

1 performed under this Contract if the CPM determines such information is needed to substantiate Change Order
2 proposals, claims, or to resolve disputes.
3

4 **3.2. CONSTRUCTION PROGRESS MEETINGS**

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

8 **END OF SECTION**
9
10

**SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION**

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PART 1 – GENERAL

1.1. SCOPE

- 16 A. The General Contractor (GC) shall be required to take weekly digital photographs of construction progress and
17 upload the photos directly to the Project Management Web Site (PMWS).
18

1.2. RELATED SPECIFICATION SECTIONS

- 20 A. Section 01 31 23 Project Management Web Site
21 B. Section 01 32 26 Construction Progress Reporting
22

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS

- 28 A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital
29 device.
30 B. Digital photographs shall be properly zoomed in/out to capture a specific level of detail as necessary.
31 C. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is
32 between 600 KB and 1.2 MB (1200KB).
33 D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify
34 pictures in the title.
35 E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the PMWS.
36

3.2. PICTURE CONTENT

- 38 A. The GC shall take exterior photographs from at least two (2) different angles.
39 1. This requirement shall only be applicable when there is exterior work connected with the project.
40 2. When applicable this requirement shall begin prior to commencing any site work.
41 3. This requirement shall end when the exterior work has been substantially completed.
42 4. This requirement may be suspended due to weather conditions or substantial delays in exterior progress.
43 B. The GC shall take interior photographs of interior construction, equipment installation, rough-ins and other such
44 progress that helps document weekly progress reporting. Interior photographs should focus on specific
45 significant installations as well as general progress throughout the progress of the contract.
46

3.3. PROJECT MANAGEMENT WEB SITE

- 48 A. The GC shall upload the digital photographs to the appropriate progress folder in the Project Images Library.
49 B. Progress folders are labeled with the Construction Week Number and the date for Monday of that week.
50 C. The GC shall notify the City of Madison Project Manager if additional progress folders need to be created.
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END OF SECTION

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SECTION 01 33 23
SUBMITTALS

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13

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

1.2. RELATED REFERENCES

- 46 A. Section 01 29 76 Progress Payment Procedures
47 B. Section 01 31 23 Project Management Web Site
48 C. Section 01 32 19 Submittals Schedule
49 D. Section 01 32 26 Construction Progress Reporting
50 E. Section 01 91 00 Commissioning
51 F. All Technical Specifications, contract documents, construction drawings, and any published addendums during
52 the bidding process.
53 G. All contract documents generated during the execution of the contract including but not limited to Requests for
54 Information (RFI) and Construction Bulletins (CB).
55
56

1.3. SUBMITTAL REQUIREMENTS

- 57 A. A completed submittal shall meet the following requirements:
58

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

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

39
40 **PART 3 - EXECUTION**

41
42 **3.1. GENERAL CONTRACTORS PROCEDURES**

- 43 A. All required submittals will be uploaded to the Construction Administration-Submittal Drawings Library on the
44 Project Management Web Site (PMWS) by the GC.
 - 45 1. The GC shall open a new Submittal Form in the Submittals Drawings Library for each required submittal
46 from the Submittals schedule.
 - 47 2. Fill in required information on the form that will be used for routing the review and comments.
 - 48 3. Attach all documentation as described in Section 1.3 above.
 - 49 a. Submit samples under separate cover to the Project Architect when necessary.
- 50 B. Uploading the submittal indicates that the GC has reviewed and approved the submittal against the contract
51 document requirements.
- 52 C. The GC shall discuss submittal status at all progress meetings and shall monitor submittal review/approval/re-
53 submittal so as to not incur delays in the project schedule.
- 54 D. A completed upload of the submittal to the PMWS initiates the review process workflow.
- 55 E. The GC and sub-contractors shall provide re-submittals as required.

1 **3.2. SUBMITTAL REVIEW**

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

10
11 **3.3. PROJECT ARCHITECTS REVIEW**

- 12 A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer
13 with the CPM and CxA as needed and determine the appropriate disposition status for the submittal (approved
14 or resubmit).
15 C. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a
16 final disposition of the submittal and update the review status of the submittal to "Complete..." (with or w/o
17 comments) or "Rejected".
18 D. A completed Final Review status initiates the PMWS to notify the GC and appropriate sub-contractor(s) that the
19 review of the submittal has been completed.
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23 **END OF SECTION**
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SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

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15 3.4. QMO CLOSEOUT PROCEDURE..... 3
16 3.5. CONSTRUCTION CLOSEOUT 3
17

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. PERFORMANCE REQUIREMENTS

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

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

13 **1.4. QUALITY ASSURANCE**

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

33 **1.5. QUALITY MANAGEMENT OBSERVATION REPORT**

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

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

41
42 **PART 3 - EXECUTION**

43
44 **3.1. QUALITY MANAGEMENT RESPONSIBILITIES**

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

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- 5. Select all categories (Sitework, Structure, Enclosure, Interior, etc) from the given list that may apply to the observation being reported.
 - a. For each category selected additional boxes shall open with contractor names associated with each category.
 - 6. Select all contractors from the lists provided that may need to be aware of the observation.
 - 7. Provide any attachments that may help provide reference to the observation.
 - 8. Click the SAVE button before closing the form.
 - D. The software for the Project Management Website will email notifications that a QMO report has been initiated. The software will automatically select and notify the following:
 - 1. The GC, PA, and CPM for all observation reports being filed.
 - 2. Others depending on the observation categories selected.
 - 3. Contractors based on the selections made in the sub-contractors lists.

3.2. RESPONDING TO A QMO

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

3.3. GENERAL CONTRACTORS FOLLOW-UP

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

3.4. QMO CLOSEOUT PROCEDURE

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

3.5. CONSTRUCTION CLOSEOUT

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

END OF SECTION

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SECTION 01 45 29
TESTING LABORATORY SERVICES

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14

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

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

1.2. RELATED REQUIREMENTS

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

1.3. QUALIFICATION OF LABORATORY

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

1.4. LABORATORY DUTIES

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

- 1 12. Interpretation of test results, when requested by A/E or the Contractor.
2 E. Perform additional tests as required by Owner, A/E or the Contractor.
3
4 **1.5. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY**
5 A. Laboratory is not authorized to:
6 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
7 2. Approve or accept any portions of the Work other than those portions of the Work scheduled for testing.
8 3. Perform any duties of the Contractor.
9
10 **1.6. CONTRACTOR'S RESPONSIBILITIES**
11 A. Cooperate with laboratory personnel, provide access to Work and to manufacturer's operations.
12 B. Secure and deliver to the laboratory, adequate quantities of representative samples of materials proposed to be
13 used and which require testing. Submit concrete mix designs to A/E for approval prior to pouring concrete.
14 C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes
15 that require control by the testing laboratory.
16 D. Furnish copies of Product test reports as required.
17 E. Furnish incidental labor and facilities:
18 1. To provide access to Work to be tested.
19 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
20 3. To facilitate inspections and tests.
21 4. For storage and curing of test samples.
22 F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and
23 scheduling of tests.
24 G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's
25 convenience.
26 H. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform
27 additional inspections, sampling and testing required when initial tests indicate work does not comply with
28 Contract Documents.
29 I. Temporarily halt the progress of the Work when tested materials do not comply with Contract Documents and
30 promptly notify the Owner or his 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 vii. One slump test shall be made for each set of test cylinders taken following the procedure
2 in ASTM C 143.
- 3 b. Test Cylinders for all Concrete
- 4 i. Each test shall consist of a minimum of four cylinders.
- 5 ii. Make test cylinders in conformity with ASTM C 31.
- 6 iii. After 24 hours three cylinders to be carefully transported to the testing laboratory for
7 moisture curing and one cylinder to be field cured.
- 8 iv. One field cured cylinder to be tested at 7 days and two laboratory cured cylinders to be
9 tested at 28 days. Reserve one cylinder for further testing.
- 10 v. The average of all strength tests representing each class of concrete, as well as the average
11 of any three consecutive strength tests for each class of concrete, shall be equal to or
12 greater than the specified strength.
- 13 vi. If the A/E has reason to believe that cylinder strength tests are not representative of the
14 strength of concrete in place, A/E shall require drilled cores to be cut and tested at the
15 Contractor's expense. Coring and testing shall be in accordance with ASTM C 42 Standard
16 Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- 17 B. **Section 05 12 00: Structural Steel Framing**
- 18 1. Welding:
- 19 a. Provide inspection of shop and field welding in accordance with Section 6 of AWS D1.1.
- 20 b. Visually inspect all welds, perform appropriate non-destructive tests on apparent defective welds.
21 Verify conformance with Specifications.
- 22 c. Non-destructive testing shall be performed on 20 percent of the total length of all full penetration
23 welds. If a sufficient number of welds are deficient, additional testing may be performed at the
24 discretion of the testing lab, at no cost to Owner.
- 25 2. Bolting:
- 26 a. Visually inspect all connections for proper number, size and type of bolt.
- 27 b. Review all bolted connections for compliance with "snug tight" requirements of AISC.
- 28 c. No Slip-critical (SC) connections/bolts are required for this project.
- 29 d. Shear Connectors, Headed/Deformed Bar Concrete Anchors:
- 30 i. Verify pre-production test records for installation of shear connectors, concrete anchors
31 and threaded studs.
- 32 ii. Shear connectors shall be struck with a hammer. Those not producing a "clean" pinging
33 sound indicative of a fully attached shear connector shall be bent 15 degrees off vertical
34 towards the nearest support by striking with a hammer. If shear connector does not
35 become loose and weld is not broken, it shall be considered acceptable, and shall be left in
36 the bent position. Replace failing shear connectors and test as before.
- 37 iii. A visual inspection shall be made of shear connectors and headed/deformed bar concrete
38 anchors after installation. If visual inspection reveals that a sound weld and a 360 degree
39 flash has not been obtained, the connector/anchor shall also be tested by bending a
40 minimum of 15 degrees off vertical opposite to the missing weld/flash, irrespective of the
41 results of the "ping" test required for shear connectors. If the connector/anchor does not
42 become loose it shall be considered acceptable and shall be left in this position. Replace
43 failing connector/anchors and inspect as before.
- 44 C. **Section 05 40 00: Cold Formed Steel Framing**
- 45 1. As directed by A/E, Contractor's testing agency may inspect the maintenance of a quality control program
46 including spot checking weldments and welding procedures in accordance with AWS standards.
- 47 D. **Section 31 20 00: Soil Compaction Control and Trenching and Backfilling**
- 48 1. Soils Engineer to be onsite during excavation operation.
- 49 2. Visually inspect, test, and certify that exposed undisturbed underlying soil is suitable for required footing
50 bearing capacity and placement of fills.
- 51 3. Maximum and minimum density of fill soil for compaction percentage of relative density and moisture
52 density shall be determined in accordance with ASTM Designation D 1557. Testing agency will test
53 compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937,
54 as applicable.
- 55 4. Number of tests as follows:
- 56 a. Subgrade, Undisturbed and Demolition Surfaces: Visual inspection and probe; test if required.
- 57 b. Interior Fills: One test per 2,500 sq. ft for each two foot or less lift.
- 58 c. Exterior Fills: One test per 2,500 sq. ft for each two foot or less lift.

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

2

3

PART 2 – PRODUCTS – THIS SECTION NOT USED

4

5

6

PART 3 – EXECUTION – THIS SECTION NOT USED

7

8

9

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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27

PART 1 – GENERAL

1.1. SUMMARY

- 30
31 A. This Section includes general procedural requirements for temporary facilities and controls including, but not
32 limited to the following:
33 1. Temporary Utilities
34 2. Telecommunications Services
35 3. Temporary Sanitary Facilities
36 4. Barriers
37 5. Fencing
38 6. Exterior Enclosures
39 7. Security
40 8. Vehicular Access and Parking
41 6. Waste Removal
42 7. Project Identification
43 8. Field Offices
44

1.2. RELATED SPECIFICATION SECTIONS

- 45
46 A. Section 01 31 19 Progress Meetings
47 B. Section 01 31 23 Project Management Web Site
48 C. Section 01 74 19 Construction Waste Management and Disposal
49

1.3. QUALITY ASSURANCE

- 50
51 A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having
52 jurisdiction, including but not limited to:
53 1. Building Code requirements
54 2. Health and safety regulations
55 3. Utility company regulations
56 4. Police, Fire Department and Rescue Squad rules
57 5. Environmental protection regulations
58 6. Joint Commission - Hospital Accreditation Standards

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

7 **1.4. TEMPORARY UTILITIES**

- 8 A. Contractor will provide the following:
9 1. Electrical power and metering, consisting of existing facilities.
10 2. Water supply, consisting of existing facilities.
11 B. General:
12 1. Existing facilities may be used.
13 C. Water Service: water is available from existing building services.
14 1. Use trigger-operated nozzles for water hoses, to avoid waste of water.
15 D. Temporary Electric Power Service: Electrical Contractor shall extend temporary power from existing building
16 services.
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. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization through
33 construction closeout.
34 B. Telecommunications services shall include:
35 1. Windows-based personal computer dedicated to project telecommunications.
36 2. Shared access to the internet via WIFI or similar wireless connection.
37 a. Access must be capable to support minimum of <10> wireless devices.
38 3. Email Account/address dedicated for GC Project Manager of GC Supervisor on site.
39

40 **1.6. TEMPORARY SANITARY FACILITIES**

- 41 A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
42 B. Temporary toilets: Comply with regulations and health codes for the type, number, location, operation, and
43 maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
44 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide
45 covered waste containers for used material.
46 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
47 C. Maintain daily in clean and sanitary condition
48 D. Water: Provide potable water approved by local health authorities
49

50 **1.7. BARRIERS**

- 51 A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be
52 hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from
53 construction operations and demolition.
54

55 **1.8. FENCING**

- 56 A. Construction: Refer to Plan Documents and Specification Section 01 76 00: Fencing Materials and Barricades
57

1 **1.9. EXTERIOR ENCLOSURES**

- 2 A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions
3 and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures
4 identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors
5 with self-closing hardware and locks.
6

7 **1.10. SECURITY**

- 8 A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized
9 entry, vandalism, or theft.
10

11 **1.11. VEHICULAR ACCESS AND PARKING**

- 12 A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for
13 emergency vehicles.
14 B. Coordinate access and haul routes with governing authorities and Owner.
15 C. Provide and maintain access to fire hydrants, free of obstructions.
16 D. Existing parking areas located at 1233 McKenna Blvd may be used for construction parking until building is
17 occupied by Owner.
18

19 **1.12. WASTE REMOVAL**

- 20 A. See Section 01 74 19 - Waste Management, for additional requirements.
21 B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
22 C. Provide containers with lids. Remove trash from site periodically.
23 D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible
24 containers; locate containers holding flammable material outside the structure unless otherwise approved by the
25 authorities having jurisdiction.
26 E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
27

28 **1.13. PROJECT IDENTIFICATION**

- 29 A. Provide project identification sign of design and construction indicated in Section 01 58 13.
30 B. Erect on site at location determined by Owner .
31 C. No other signs are allowed without Owner permission except those required by law.
32

33 **1.14. FIELD OFFICES**

- 34 A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy
35 furniture, drawing rack and drawing display table.
36 B. Field Office shall be located in job trailer or existing building.
37 C. Provide space for Project Meetings with table and chairs to accommodate a minimum of 10 persons.
38

39 **PART 2 - PRODUCTS**

40
41 **2.1. TEMPORARY PARTITIONS**

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

47 **2.2. EQUIPMENT**

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

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

10
11 **PART 3 - EXECUTION**

12
13 **3.1. TEMPORARY FIRE PROTECTION**

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

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

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

38
39 **3.3. ENVIRONMENTAL PROTECTION**

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

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

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

53
54
55
56 **END OF SECTION**

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

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13 3.2. REMOVAL 1
14

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 logo and name of Owner as indicated on Contract Documents.
2. Names and title of Architect.
3. Name of Prime Contractor.
4. Full color project rendering from high resolution image as furnished by Architect.

PART 3 - EXECUTION

3.1. INSTALLATION

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

3.2. REMOVAL

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

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

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17 3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT 4
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 Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard 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 Standard Specification 210.2” click the link for Part II, the Part II
40 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

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

46

47 **PART 3 - EXECUTION**

48

49 **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 Standard Specification Section 210.1(f) and other related
15 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.

- 1 2. After installation, free/open ends shall remain protected with taped plastic sheathing and or temporary
- 2 filters as specified by division or Trade specifications.
- 3

4 **3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT**

- 5 A. Section 3.8.A. shall apply to all equipment being provided to any contractor directly from the Owner for
- 6 installation under the contract.

- 7 1. The Owner or Owners Representative shall do the following:

- 8 a. Inspect all deliveries upon receipt and notify manufacturer of any issues directly.
- 9 b. Review the received shipment with the contractor.
 - 10 i. Only provide products or materials to the contractor that were not damaged through
 - 11 shipping or handling.
 - 12 ii. Confirm missing products or materials and anticipated delivery schedule if known.

- 13 2. The Contractor responsible for the installation of Work associated with Owner provided materials or
- 14 products shall "take ownership" and provide safe and secure storage and handling as previously
- 15 described within this specification.

- 16 i. The Contractor shall be liable for the repair or replacement of any material or product
- 17 damaged after taking ownership of the product from receipt through final acceptance.

- 18 B. Section 3.8.B. shall apply to all equipment being provided by the Owner but shipped directly to any sub-
- 19 contractor or the project site for installation under the contract.

- 20 1. The GC and/or Contractor responsible for the Work associated with the Owner provided materials or
- 21 products shall do the following:

- 22 a. Inspect all deliveries upon receipt and notify the Owner or Owners Representative of any issues
- 23 directly.
- 24 i. Owner or Owners Representative shall notify manufacturer of any issues directly.
- 25 b. Review the received shipment with the Owner or Owners Representative
- 26 i. Confirm missing products or materials and anticipated delivery schedule if known.

- 27 2. The Contractor shall "take ownership" and provide safe and secure storage and handling as previously
- 28 described within this specification.

- 29 i. The Contractor shall be liable for the repair or replacement of any material or product
- 30 damaged after taking ownership of the product from receipt through final acceptance.
- 31
- 32
- 33
- 34
- 35

END OF SECTION

**SECTION 01 71 23
FIELD ENGINEERING**

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PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

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

1.2. RELATED REQUIREMENTS

- A. Conditions of the Contract

1.3. PROCEDURES

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

1.4. PROJECT SURVEY REQUIREMENTS

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

1.5. RECORDS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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**SECTION 01 73 29
CUTTING AND PATCHING**

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17

PART 1 – GENERAL

1.1. SUMMARY

- 20
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

- 28
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

- 33
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

- 39
40 A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying
41 capacity or load-deflection ratio.
42 B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results
43 in reducing their capacity to perform as intended or that may result in increased maintenance or decreased
44 operational life or safety.
45 C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that
46 could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that
47 may result in increased maintenance or decreased operational life or safety. Some miscellaneous elements
48 include the following:
49 1. Water, moisture, or vapor barriers
50 2. Membranes and flashings
51 3. Exterior curtain-wall construction
52 4. Equipment supports
53 5. Piping, ductwork, vessels, and equipment
54 6. Noise and vibration control elements and systems
55 D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and
56 patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that
57 would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has
58 been cut and patched in a visually unsatisfactory manner.

1 **1.5. WARRANTY**

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

7 **PART 2 - MATERIALS**

8
9 **2.1. GENERAL**

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

16 **PART 3 - EXECUTION**

17
18 **3.1. EXAMINATION**

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

24 **3.2. PREPARATION**

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

35 **3.3. PERFORMANCE**

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

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

4 **3.4. CLEANUP AND RESTORATION**

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

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**SECTION 01 74 13
PROGRESS CLEANING**

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16

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

- 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

29 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.

- 1 iii. Mop heads shall be rinsed often and replaced as necessary.
2 iv. Mop heads and buckets shall be thoroughly rinsed with each change of water.
3 v. Only new mop heads shall be used for rinsing.
4 E. Refer to all other specifications in this contract for specific requirements regarding final cleaning of finishes,
5 fixtures, equipment, etc.
6 F. Exterior Cleaning shall include but not be limited to the following:
7 1. All exterior glazing surfaces have been professionally cleaned and are free of dust and streaking.
8 2. Metal roofs, siding, and other surfaces shall be clean of dirt and free of splashed or excess materials such
9 as sealants, mortar, paint, etc.
10 3. All exterior furnishings shall be clean, waste receptacles shall be empty.
11 4. Paved areas shall be clean, free of dirt, oily stains and other such blemishes
12 5. Exterior lights and diffusers are clean and free of dust.
13 G. Interior Cleaning shall include but not be limited to the following:
14 1. Remove all labels, stickers, tags, and other such items which are not required by code as permanent
15 labels.
16 2. All interior glazing surfaces, including mirrors, have been professionally cleaned and are free of dust and
17 streaking.
18 3. All interior surfaces have been cleaned of excess materials such as paint, sealants, etc and have been
19 wiped free of dust.
20 4. Interior metals, fixtures, and trim have been cleaned free of dust and oily residues
21 5. Carpet flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains
22 removed per manufacturers use and care instructions.
23 6. Resilient flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains
24 removed, mopped and buffed per manufacturers use and care instructions.
25 7. Interior non-occupied concrete floors shall be broom cleaned, vacuumed free of dust, excess glues and
26 other stains removed per manufacturers use and care instructions.
27 8. Light fixtures, lamps, diffusers and other such items have been dusted and cleaned as necessary.
28

29 **3.5. CALL BACK WORK**

- 30 A. The GC shall be responsible for ensuring that any contractor returning to the project site for completion or
31 correction work has re-cleaned and restored the area to the levels described in section 3.4 above upon
32 completion of the work. This shall include but not be limited to the following:
33 1. The immediate area(s) where work was completed.
34 2. Adjacent areas where dust or debris may have traveled.
35 3. Other areas occupied during the completion of the call back work.
36 4. Path of entrance/exit, to/from the area(s) of work.
37
38
39
40
41

END OF SECTION

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

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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 his/her 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. Statement that the credit requirements have been met.
- 21 4. GC shall sign the letter.
- 22

1.7. QUALITY ASSURANCE

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

1.8. WASTE MANAGEMENT PLAN

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

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

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

20
21 **PART 3 - EXECUTION**

22
23 **3.1. PLAN IMPLEMENTATION**

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

43 **3.2. HAZARDOUS AND TOXIC WASTE**

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

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

- 51 A. Recycle all paper and beverage containers used by workers, sub-contractors, suppliers and visitors to the project
- 52 site.
- 53 B. All revenues, savings, rebates, tax credits, and other such incentives received from recycling, reusing, or
- 54 salvaging waste materials shall accrue to the GC unless specified otherwise in the contract documents.
- 55 C. Separate recyclable, reusable, and salvageable waste from other waste materials, trash, and debris except where
- 56 Waste Management Disposal Company allows comingled waste materials, see section 1.8.D above.
- 57 1. Separate by type in appropriate containers or designated areas according to the approved waste
- 58 management plan away from the construction area. Do not store within the drip lines of existing trees.

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

8 **3.4. GUIDELINES FOR RECYCLABLE, RE-USABLE, AND SALVAGEABLE WASTE**

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

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

14 **3.5. GUIDELINES FOR DISPOSAL OF WASTES**

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

END OF SECTION

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

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PART 1 – GENERAL

1.1. SUMMARY

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

1.2. QUALITY ASSURANCE

- 43 A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all
44 existing work, and newly installed construction.
45 B. It shall be the General Contractors' (GC) responsibility under the contract to provide all reasonable protection
46 methods, materials, or precautionary measures required to protect new or existing construction as described in
47 within this specification to the project as a whole.
48 1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced
49 at no additional cost to the Contract.
50 2. The GC at his/her discretion may direct other contractors to provide and maintain protection of
51 completed work associated with their Division of Work. I.E.: The carpet installer may be required by the
52 GC to 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.

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1.3. RELATED SPECIFICATIONS

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

PART 2 - PRODUCTS

2.1. FENCING MATERIALS AND BARRICADES

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

2.2. EROSION CONTROL PROTECTION

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

2.3. INTERIOR FINISH PROTECTION MATERIALS

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

- 1 B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect (PA)
2 and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as
3 necessary.
4 1. The PA 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 him/her 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.

- 1 2. Whenever possible remove and temporarily store all existing landscape features such as benches, waste
- 2 receptacles, signage, and other such features that will be within the area of Work that can be removed.
- 3 3. Landscape features that cannot be removed such as flag poles, light poles, light bollards, etc. shall be
- 4 protected with Type D fencing for areas on pavement or Type E fencing for areas on soil.
- 5 4. Planting beds shall be protected using Type E fencing around the exposed perimeter of the planting bed
- 6 as needed.
- 7 5. The City of Madison Standard Specification 107.13 shall apply to all tree protection in and around the
- 8 project site at all times.
- 9

10 **3.4. PROTECT UTILITIES**

- 11 A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and
- 12 protection requirements prior to installing any construction protection.
- 13 1. This includes requesting utility marking through Diggers Hotline.
- 14 a. Call 811 or 1-800-242-8511 to request a public utility locate
- 15 b. For emergency locate call (262) 432-7910 or (877) 500-9592
- 16 2. Contact the Owner and CPM for any available private utility information on the property that may be
- 17 available prior to calling a private utility locating company.
- 18 B. Except where specifically stated in other areas of the construction documents the following minimal protection
- 19 requirements shall apply under this section.
- 20 1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D
- 21 fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to
- 22 not be directly over the utility main.
- 23 2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison
- 24 Standard Specification 210.1(g) and Type C Construction Barrels when necessary.
- 25 3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to
- 26 City of Madison Standard Specification 210.1(g) and Type E fencing for areas on soil.
- 27 4. Stormwater management features such as greenways, retention/detention ponds, bio-filtration ponds
- 28 and other such features shall be properly protected according to the appropriate erosion control
- 29 measure specified on the Erosion Control Plan. See multiple sections of City of Madison Standard
- 30 Specification 210.1
- 31 a. For the protection of hard to see items such as structures, castings, inlets, etc. in grassy areas
- 32 provide Type E fencing for areas on soil.
- 33 c. For the protection of storm water management features having special soils and plants such as
- 34 bio-filtration ponds provide Type E fencing for areas on soil.
- 35 5. Other structures and covers including but not limited to cleanouts, wiring hand holes, valve boxes, access
- 36 structures, grease trap structures, etc shall be protected as follows:
- 37 a. Provide Type E fencing for areas on soil.
- 38 b. When paving operations are complete provide a construction barrel or cone near structures as
- 39 necessary depending on required heavy construction traffic.
- 40

41 **3.5. PROTECT PUBLIC RIGHT OF WAY**

- 42 A. Except where specifically stated in other areas of the construction documents the following minimal protection
- 43 requirements shall apply under this section.
- 44 1. All public right-of-way (area from behind the sidewalk to the centerline of the street) shall remain open
- 45 and accessible except during periods of active work. At such times the public right of way shall be
- 46 properly closed and signed as referenced in City of Madison Standard Specification 107.9.
- 47 2. Bus stops and bus stop structures shall remain accessible at all times.
- 48 3. Traffic signage and traffic signals, traffic control boxes shall be protected with Type D fencing for areas on
- 49 pavement or Type E fencing for areas on soil.
- 50 a. Protection at traffic signage/signals shall not obstruct the viewing of the sign/signal for its
- 51 intended purpose at any time.
- 52 B. When additional protection for traffic control is required, the use of barricades, guardrails, lane closures and
- 53 other such procedures will be detailed within the construction documents.
- 54 C. When additional protection for overhead sidewalk cover is required the contract documents shall indicate the
- 55 specific location and structural requirements of the protective structure.
- 56

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, and GC mutually deem the project is ready for Final Cleaning.
2 The contractors responsible for protecting the work shall be responsible for removing the protection and
3 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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18

END OF SECTION

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

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PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

- 41 A. Contractors shall review all references to other specifications including specifications relating to the execution of
42 the Work associated with their Division or Trade.
43 B. Section 01 29 76 Progress Payment Procedures
44 C. Section 01 31 23 Project Management Web Site
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. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
- 4 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
- 5 5. Documentation required for Small Business Enterprise (SBE) goals
- 6 6. Other documents as maybe required or requested through the Finalization Review Process

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONSTRUCTION CLOSEOUT CHECKLIST

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

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

3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS

- A. The timely submittal or completion of closeout requirements shall go hand in hand with the Progress Payment Milestone Schedule that can be found in Specification 01 29 76 Progress Payments. No payments shall be made until all requirements for that payment have been met.
 1. The GC and all major Subcontractors, PA, and CPM, shall review all requirements for Construction/Contract Closeout during two (2) special meetings.

- 1 a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall
2 discuss the requirements associated with various construction/contract closeout documentation
3 and events when they are due with respect to progress payments.
4 b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting
5 shall review the contractors progress regarding the closeout checklist, begin making plans for
6 upcoming deadlines such as scheduling training, where to put attic stock, and when they are due
7 with respect to progress payments.
8 2. The GC, PA, and CPM, shall utilize the Construction Closeout checklist to ensure that all construction
9 closeout requirements have been met.

10
11 **3.3. CONSTRUCTION CLOSEOUT PROCEDURE**

- 12 A. Upon successful completion and final acceptance of all Construction Closeout Requirements the GC may submit
13 to the CPM and PA the request for Final Progress Payment (100% contract total, less retainage).
14 B. The PA will confirm with the design consultants, CPM, and other City of Madison staff that all requirements of
15 the Work have been completed and will do the following:
16 1. Approve the final progress payment application
17 2. Provide the required signed payment documents to the CPM
18 3. Provide the required Letter of Substantial Compliance to the following as required:
19 a. State Safety and Building Division
20 b. Local Building Inspection office
21 c. GC
22 d. CPM
23 C. The CPM shall draft the City Letter of Substantial Completion for signature by the City Engineer. This letter shall
24 state any of the following that may still be tied to the contract and/or warranty:
25 1. Indicate that the date of the letter shall also be the beginning of the Warranty period.
26 2. Indicate any allowed due outs, reasons for them, and anticipated dates of finalization.
27 a. QMO issues such as off season testing of equipment
28 b. Off season training of equipment
29 D. The GC and all subcontractors shall finalize all warranty letters associated with their Work using the date noted
30 on the City Letter of Substantial Completion, and provide the CPM with all warranties as described in
31 Specification 01 78 36 Warranties. Upon receipt and final approval of the Warranties the CPM may initiate final
32 processing of the Final Progress Payment (100% contract total, less retainage).
33

34 **3.4. CONTRACT CLOSEOUT REQUIREMENTS**

- 35 A. The GC and all sub-contractors shall follow all requirements associated with documenting contract compliance
36 and provide documentation as required or requested by DCR or PW staff. All contractors are encouraged to stay
37 current with submissions of the following documentation:
38 1. Weekly Payroll Reports no later than the Progress Payment equal to 50% of the contract total.
39 2. Employee Utilization Reports
40 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
41 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
42 5. Documentation required for Small Business Enterprise (SBE) goals
43 6. Other documents as maybe required or requested through the Finalization Review Process
44 B. Near the Progress Payment equal to 80% of the contract total the GC shall request in writing a Finalization
45 Review. At that time DCR or PW staff shall prepare a report of all contract documentation submitted to date. A
46 list of missing items or outstanding issues will be emailed to the GC. No additional follow-up will be generated
47 by DCR or PW Staff.
48

49 **3.5. CONTRACT CLOSEOUT PROCEDURE**

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

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

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

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PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

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14 3.3. O&M DATA FINAL SUBMITTAL 3
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PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

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

1.4. O&M DATA REQUIREMENTS

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

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

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
36 **PART 3 - EXECUTION**

37
38 **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_Project name_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. *Project Name* represents the title of the project or contract. A shortened version of the
54 title may be identified by the City Project Manager to be used by all contractors.
55 iv. *Contract number* is the specific identification number the Work was bid under and appears
56 on the plan set title sheet and in each sheet title block
57 v. *Year* represents the year the contract will be closed out
58 b. Examples of file names

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

7 **3.2. O&M DATA DRAFT SUBMITTAL**

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

<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	

26
 27 **3.3. O&M DATA FINAL SUBMITTAL**

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

44 **3.4. CONSTRUCTION CLOSEOUT**

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

END OF SECTION

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SECTION 01 78 36
WARRANTIES

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16

PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all
21 Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items
22 required by the Construction Documents.
23 B. Manufacturers’ disclaimers and limitations on product warranties do not relieve any contractor of the warranty on
24 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 his/her responsibilities during
47 the 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 his/her 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 project name, contract number, and contract address the warranty is for on the reference line.
 - 3. Provide a description of the warranty(ies) being provided.
 - a. Include Division, Trade, or Specification information as necessary.
 - b. Only combine warranties of related Divisional Work together. Create new letters for additional Divisions as necessary.
 - 4. Indicate the effective Warranty Date. As noted in Section 1.3.F above, the Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
 - 5. Contractor Letters of Warranty shall only be signed by a principal officer of the company.
 - 6. After signing the letter provide the GC with a high quality color scanned image in PDF format and the original signed letter.
- B. The GC shall be responsible for the Final Warranty submittal as identified in Section 3.4 below.
- C. The GC shall obtain letters of warranty from all of the following:
 - 1. The General Contractor shall provide warranty letters for all Work that was self performed under the contract documents, identify all trades or Divisions of Work.
 - 2. All Sub-contractors shall provide warranty letters for Work performed under the contract documents; identify all trades or Divisions of Work.
 - 3. Suppliers, as required by other specifications within the Construction Documents where the manufacture of a specific product unique to the Work of this contract was required.
 - a. The terms and conditions of the Supplier Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship within one (1) year of the warranty date.
 - b. When the supplier is also the installer a single written letter may be submitted identifying both the warranty for the manufacture of the product and the warranty for the installation of the product.
 - 4. Installers as required by other specifications within the Construction Documents where the installation of a specific product unique to the Work of this contract was required.
 - 1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair,

- 1 or replace defective materials and workmanship associated with the installation of the product
2 within one (1) year of the warranty date.
3 5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who
4 agrees to provide warranty services required by any Division Specification in excess of their Standard
5 Product Warranty.
6

7 **3.3. STANDARD PRODUCT WARRANTY**

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

34 **3.4. FINAL WARRANTY SUBMITTAL**

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

49 **3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP**

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

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

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

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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 SPECIFCAITONS

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

1.3. RELATED DOCUMENTS

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

1.4. PERFORMANCE REQUIREMENTS

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

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

8 **1.5. QUALITY ASSURANCE**

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

24 **PART 2 – PRODUCTS**

25
26 **2.1. OFFICE SUPPLIES**

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

38 **PART 3 - EXECUTION**

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

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

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

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

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

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

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

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

43
44 **3.4. AS-BUILT REVIEW AND ACCEPTANCE**

- 45 A. The GC shall provide the Master As-Built Plan Set to the Project Architect (PA), the City Project Manager (CPM),
46 the Commissioning Agent (CxA) and other design team staff for content review prior to the Progress Payment
47 Milestone indicated in Specification 01 29 76 Progress Payment Procedures. The submitted plan set shall include
48 the digital survey information produced under Section 3.2 above.
- 49 1. If the plan set is not approved:
- 50 a. The PA 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 shall take possession of the plan set to be used in providing the owner
56 with digital CAD record drawings. Upon completion of transferring the information to CAD the PA shall
57 provide the Owner with CAD record drawings, record PDFs, and the Master As-Built Plan Set.
- 58

- 1 **3.5. CHANGES AFTER ACCEPTANCE**
- 2 A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the
- 3 PA and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of
- 4 his/her guarantee.
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END OF SECTION

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**SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS**

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16 3.5. CLOSEOUT PROCEDURE 3
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

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

1.3. DEFINITIONS

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

1.4. PERFORMANCE REQUIREMENTS

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

1.5. QUALITY ASSURANCE

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. PACKAGING

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

3.2. LABELING

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

3.3. INVENTORY

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

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3.4. STORAGE

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

3.5. CLOSEOUT PROCEDURE

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

END OF SECTION

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**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

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16

PART 1 – GENERAL

1.1. SUMMARY

- 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) and City Project
25 Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being trained. New
26 equipment and systems may have complete D&T sessions as described in this specification while equipment or
27 systems staff is familiar with may have sessions more focused on maintenance only.
28

1.2. RELATED SPECIFICATIONS

- 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

- 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:

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

11
12 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

13
14 **PART 3 - EXECUTION**

15
16 **3.1. GENERAL REQUIREMENTS**

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

20
21 **3.2. COORDINATING AND SCHEDULING THE TRAINING**

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

48
49 **3.3. TRAINING OBJECTIVES**

- 50 A. For each piece of equipment or system installed train on the following objectives/topics as applicable:
- 51 1. System design, concept, and capabilities
- 52 2. Review of related contractor as-built drawings
- 53 3. Facility walkthrough to identify key components of the system
- 54 4. System operation and programming including weekly, monthly, annual test procedures
- 55 5. System maintenance requirements
- 56 6. System troubleshooting procedures
- 57 7. Testing, inspection, and reporting requirements associated with any regulatory requirements
- 58 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 and CPM.
- 51 C. The PA and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been
- 52 met. The PA and CPM will approve the program as submitted or recommend changes for re-submittal as
- 53 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 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 and CPM that each Demonstration and Training Session was conducted properly and
- 30 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**

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 WORK INCLUDED

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the demolition of such features as required in these specifications and on the drawings. Included are the following:
1. Demolish partitions, ceilings, flooring, finishes, doors and other items as indicated.
 2. Protect portions of building adjacent to or affected by selective demolition. Take appropriate measures to protect existing facilities operations against dust contamination. Materials shall be removed from the existing building without disruption to the Owner or facility operations.
 3. Remove and legally dispose of demolished materials off-site.
 4. Demolish and salvage for reuse those items noted on the drawings.
 5. Recycle construction and demolition waste including metals and cardboard. Recycle carpet and ceiling tiles if practicable.
 6. Salvage existing door hardware for reuse as indicated on drawings.

1.3 RELATED WORK

- A. Construction Waste Management and Disposal, Section 01 74 19

1.4 SUBMITTALS

- A. For utilities or other services requiring removal or abandonment in-place, submit materials documenting completion of such work.
- B. Submit copies of records documenting recycling or disposal of demolition materials from the site.

1.5 DEFINITIONS

- A. "Remove": Remove and legally dispose of items, except those indicated to be reinstalled.
- B. "Remove and Reinstall": Remove items indicated; clean, service and otherwise prepare them for reuse; store and protect against damage. Reinstall in the same location or in locations indicated.
- C. "Existing to Remain": Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the A/E, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.6 QUALITY ASSURANCE

- A. Comply with governing codes and regulations.

- 1 1.7 RECORD DRAWINGS
2
3 A. Maintain record drawings showing actual locations of utilities and other features encountered,
4 and any deviations from the original design. Show actual limits of removal and demolition.
5
6 1.8 SAFETY
7
8 A. Verify that all gas and electrical utilities have been abandoned or disconnected and associated
9 hazards mitigated, prior to beginning any demolition.
10
11 B. Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other
12 explosive or toxic fluids or gases. Purge lines and contain materials in accordance with all
13 applicable regulations. Store such piping outdoors until fumes are removed.
14
15 C. Maintain a clean and orderly site. Remove debris at end of each workday.
16
17 D. If hazardous materials are not anticipated, but encountered, terminate operations and contact the
18 Owner's Construction Representative immediately. Follow all applicable local, state and federal
19 regulations pertaining to hazardous materials.
20
21 1.9 PERMITS
22
23 A. Unless otherwise noted, Contractor shall be responsible for obtaining and paying for all permits
24 necessary to complete demolition work.
25
26 B. If necessary, file and maintain Notification of Demolition and/or Renovation and Application for
27 Permit Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative
28 Code Chapter NR447.
29
30 1.10 DISCONNECTION OF SERVICES
31
32 A. Prior to starting removal and/or demolition operations be responsible and coordinate
33 disconnection of all existing utilities, communication systems, alarm systems and other services.
34
35 B. Disconnect all services in manner which insures continued operation in facilities not scheduled
36 for demolition.
37
38 C. Disconnect all services in manner which allows for future connection to that service.
39
40 D. Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.
41
42 1.11 REMOVAL/SALVAGING OF ITEMS
43
44 A. Carefully remove all items that are scheduled to be salvaged.
45
46 B. Secure salvaged items to allow for future movement; provide pallets, skids and other devices as
47 necessary. Secure all loose parts.
48
49 C. Provide crates, padding, tarps and other measures necessary to protect salvaged items during
50 storage. Store items in secure location, safe from vandalism, weather, dust and other adverse
51 elements.
52
53 D. Where salvaged items are indicated to be turned over to Owner, deliver to location on property
54 where designated by Owner.

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- E. Where indicated to be incorporated into new work, store the salvaged item in secure location until trade responsible for re-installation mobilizes his equipment and storage facilities to the site, or otherwise accepts responsibility for the salvaged item.
- F. Items of salvage value that are not to be returned to the Owner or the A/E shall be removed from the structure. Storage or sale of such salvage items at project site is prohibited.

PART 2 - PRODUCTS

2.1 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 GENERAL

- A. Examine all areas of work, verify all existing conditions, and report any unsatisfactory conditions.

3.2 PROTECTION OF EXISTING WORK AND FACILITIES

- A. Verify the locations of, and protect, any building elements, utilities, and all other such facilities that are intended to remain or be salvaged.
- B. Make such explorations and probes as necessary to ascertain any required protection measures that shall be used before proceeding with demolition.
- C. Take all measures necessary to safeguard all existing work and facilities which are outside the limits of the work.
- D. Furnish and install temporary enclosures or other barriers as shown on the plans or as otherwise necessary to protect existing features.
- E. Protect adjacent interior areas from collection of dust and noxious fumes. Seal HVAC system ductwork and grilles to prevent contamination of building or mechanical systems.
- F. Provide protection for workers, public, adjacent construction and occupants of existing building(s).
- G. Report damage of any facilities or items scheduled for salvaging to the Owner's Construction Representative.
- H. Repair or replace any damaged facilities that are not scheduled for demolition.
- I. Do not damage building elements and improvements indicated to remain.
- J. Do not close or obstruct walks, drives, other occupied or used spaces, or facilities without the written permission from the A/E and the authorities having jurisdiction.

- 1 K. Do not interrupt utilities serving occupied facilities without permission from the A/E and
2 authorities having jurisdiction. If necessary, provide temporary utilities.
3
- 4 L. Cease operations if public safety or remaining structures are endangered. Perform temporary
5 corrective measures until operations can be continued properly.
6
- 7 M. If necessary, provide additional materials to protect existing building components that are to
8 remain.
9
- 10 N. Where necessary to prevent collapse of any construction, install temporary shores, struts or
11 bracing. Do not commence demolition work until all temporary construction is complete.
12
- 13 O. Take precautions to guard against movement, settlement or collapse of any surrounding
14 construction designated to remain and be liable for any such movement, settlement or collapse.
15
- 16 3.3 DEMOLITION
17
- 18 A. Remove all equipment, fixtures and other materials scheduled for salvage prior to beginning
19 demolition operations.
20
- 21 B. Abandon gas, electric and communication utilities in accordance with local utility company
22 requirements, or applicable substantive requirements if considered private.
23
- 24 C. Remove all sealant, fasteners and damaged or rotten blocking from existing construction to
25 remain where demolition occurs.
26
- 27 D. Remove all structures, retaining walls, stairs, paved surfaces, vegetation, and any other items;
28 noted on the drawings to be removed or demolished.
29
- 30 3.4 TRANSPORTATION AND DISPOSAL OF DEMOLITION WASTE
31
- 32 A. Transport and dispose all demolition waste in accordance with local, state, and federal
33 guidelines.
34 1. Recycle fluorescent lamps and other lamps containing heavy metals with a company
35 engaged in the proper handling and recycling of these materials.
36 2. Properly dispose of any lamp ballasts containing PCB's.
37
- 38 B. Whenever possible, or otherwise required by the Contract Documents, recycle demolition waste.
39
- 40 C. Demolition waste that cannot be recycled shall be disposed of at a landfill or dumpsite designed
41 and approved to accept the given waste.
42
- 43 D. Maintain records documenting recycling of demolition waste. Record description of material,
44 date removed, quantity removed and recycling destination.
45 1. Provide copies of records to AE at completion of project.
46
- 47 3.5 SCHEDULE
48
- 49 A. Items to be removed shall be as indicated on the Drawings.
50
- 51 B. Items to be salvaged, stored and reinstalled as indicated on Drawings.
52
- 53 C. Items to remain as indicated on the Drawings.
54

- 1 3.6 CLEANING
2
3 A. All adjacent areas shall be broom cleaned and ready to receive new construction.
4
5 B. Remove from the site all debris resulting from the Work of this Section.
6
7

8 END OF SECTION 02 41 19

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Field quality-control test reports.
- E. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Steel reinforcement and accessories.
 4. Fiber reinforcement.
 5. Curing compounds.
 6. Vapor retarders.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities.
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.02 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:

- 1 a. Fly Ash: ASTM C 618, Class C.
 2 b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 3 2. Normal-Weight Aggregates: ASTM C 33 Free of materials with deleterious reactivity to
 4 alkali in cement.

5
 6 B. Water: ASTM C 94/C 94M and potable.

7
 8 2.03 VAPOR RETARDERS

- 9 A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less
 10 than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint
 11 tape.

12
 13 2.04 CURING MATERIALS

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

16
 17 2.05 CONCRETE MIXTURES

- 18 A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of
 19 laboratory trial mixture or field test data, or both, according to ACI 301.
 20

Concrete Mix Design Schedule							
Type of construction	28 day strength (psi) (ASTM C39)	Max Slump +/- 1" (inches) (ASTM C143) (D)	Maximum aggregate size (inch)	Percent of air entraining +/- 1-1/2%	Maximum water/cementitious material ratio	Minimum Cementitious Materials per cubic yard	Additional Comments
Footings	3000	4	1-1/2	--	--	--	(A)
Foundation Walls	3000	3	1	4-1/2	--	--	(A)
Interior Slab on Grade	4000	3	1	--	--	520	(B) (E)
Exterior Slab on Grade	4500	3	1	6	0.45	520	(B) (E)

21
 22 Comments:

- 23 A) Maximum replacement of cementitious materials by weight flyash 25%, slag 50%, Limit total re-
 24 placement of cementitious materials to 50%
 25 B) Maximum replacement of cementitious materials by weight flyash 15%, slag 30%, Limit total re-
 26 placement of cementitious materials to 30%,
 27 C) Provide 4-1/2% Air Entrainment At Exposed Conditions
 28 D) Slump may be increased when chemical admixtures are used, provided that the admixture treated
 29 concrete has the same or lower water-cement ratio and does not exhibit segregation potential or
 30 excessive bleeding.
 31 E) Concrete supplier and finisher shall coordinate approximate set times of proposed mix design un-
 32 der various weather conditions and adjust mix design as necessary to assure set time is acceptable
 33 to complete placing and finishing of slab in a timely manner.
 34

35 2.06 FABRICATING REINFORCEMENT

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

- 1
2 2.07 CONCRETE MIXING
3 A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to
4 ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
5 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from
6 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and
7 delivery time to 60 minutes.
8
9 PART 3 - EXECUTION
10
11 3.01 FORMWORK
12 A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical,
13 lateral, static, and dynamic loads, and construction loads that might be applied, until structure
14 can support such loads.
15
16 B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation,
17 and position indicated, within tolerance limits of ACI 117.
18
19 C. Chamfer exterior corners and edges of permanently exposed concrete.
20
21 3.02 VAPOR RETARDERS
22 A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643
23 and manufacturer's written instructions.
24 1. Lap joints 6 inches and seal with manufacturer's recommended tap.
25
26 3.03 STEEL REINFORCEMENT
27 A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
28 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before
29 placing concrete.
30
31 B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that
32 would reduce bond to concrete.
33
34 C. Accurately position, support, and secure reinforcement against displacement. Locate and
35 support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld
36 crossing reinforcing bars.
37 1. Weld reinforcing bars according to AWS D1.4, where indicated.
38
39 D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
40
41 E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to
42 minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset
43 laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with
44 wire.
45
46 3.04 CONCRETE PLACEMENT
47 A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded
48 items is complete and that required inspections have been performed.
49
50 B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new
51 concrete will be placed on concrete that has hardened enough to cause seams or planes of
52 weakness. If a section cannot be placed continuously, provide construction joints as indicated.
53 Deposit concrete to avoid segregation.
54 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

- 1
2 C. Cold-Weather Placement: Comply with ACI 306.1.
3
4 D. Hot-Weather Placement: Comply with ACI 301.
5
6 3.05 FINISHING FORMED SURFACES
7 A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes
8 and defects repaired and patched. Remove fins and other projections that exceed specified limits
9 on formed-surface irregularities.
10 1. Apply to concrete surfaces not exposed to public view .
11
12 B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in
13 an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and
14 defects. Remove fins and other projections that exceed specified limits on formed-surface
15 irregularities.
16
17 3.06 FINISHING FLOORS AND SLABS
18 A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and
19 finishing operations for concrete surfaces. Do not wet concrete surfaces.
20
21 B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-
22 floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch
23 in 1 direction.
24 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to
25 receive mortar setting beds for bonded cementitious floor finishes
26
27 C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or
28 inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots.
29 Repeat float passes and restraightening until surface is left with a uniform, smooth, granular
30 texture.
31
32 D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by
33 hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of
34 trowel marks and uniform in texture and appearance. Grind smooth any surface defects that
35 would telegraph through applied coatings or floor coverings.
36 1. Finish and measure surface so gap at any point between concrete surface and an
37 unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed
38 anywhere on the surface does not exceed 1/4 inch
39
40 E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and
41 elsewhere as indicated.
42
43 3.07 CONCRETE PROTECTING AND CURING
44 A. General: Protect freshly placed concrete from premature drying and excessive cold or hot
45 temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather
46 protection during curing.
47
48 B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or
49 windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing
50 operations. Apply according to manufacturer's written instructions after placing, screeding, and
51 bull floating or darbying concrete, but before float finishing.
52
53 C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
54 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.

- 1 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining
2 cover for curing concrete, placed in widest practicable width, with sides and ends lapped
3 at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than
4 seven days. Immediately repair any holes or tears during curing period using cover
5 material and waterproof tape.
6 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller
7 according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall
8 within three hours after initial application. Maintain continuity of coating and repair
9 damage during curing period.
10 a. After curing period has elapsed, remove curing compound without damaging
11 concrete surfaces by method recommended by curing compound
12 manufacturer unless manufacturer certifies curing compound will not interfere
13 with bonding of floor covering used on Project.
14 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a
15 continuous operation by power spray or roller according to manufacturer's written
16 instructions. Recoat areas subjected to heavy rainfall within three hours after initial
17 application. Repeat process 24 hours later and apply a second coat. Maintain continuity
18 of coating and repair damage during curing period.
19
20 3.08 CONCRETE SURFACE REPAIRS
21 A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove
22 and replace concrete that cannot be repaired and patched to Architect's approval.
23
24

END OF SECTION 03 30 00

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Metal accessories.
1. Including, but not limited to, anchors, bolts, screws, joist hangers, and fasteners.
- B. Misc. metal brackets, angles, supports, etc. as shown on drawings.

1.03 RELATED WORK

- A. Cast-in-Place Concrete: Section 03 30 00.
- B. Rough Carpentry: Section 06 10 00.
- C. Finished Carpentry: Section 06 20 00.
- D. Painting: Section 09 90 00.

1.04 REFERENCES

- A. Metal Fabrications shall be in strict accord with Wisconsin Commercial Building Code, Chapter 11 - "Accessibility".

1.05 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
1. Shop drawings required for all items. Show all work to be fabricated with all construction details shown in appropriate scale, methods of attachments to other materials, finished dimensions, shop welds and grinding of welds, field assembly joints, etc.
2. Coordinate work with other suppliers and subcontractors; obtain their approved shop drawing where necessary, or obtain any necessary additional detail information regarding mounting conditions or other aspects of related work.

1.06 QUALITY ASSURANCE

- A. Take field measurements prior to shop drawing preparation and fabrication.
- B. Comply with the provisions of the following except as otherwise indicated:
1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including the "Commentary" and Supplements thereto as issued.
3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
4. AWS D1.1 "Structural Welding Code".

1 C. Qualify welding process and welding operators in accordance with the AWS "Standard Qualification
2 Procedure". Provide certification that welders to be employed in the work have satisfactorily passed
3 AWS qualification tests within the previous twelve months. If recertification of welders is required,
4 retesting will be the Contractor's responsibility.

5
6 D. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
7 Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for
8 reassembly and coordinated installation.

9
10 1.07 DELIVERY, STORAGE AND HANDLING

11
12 A. Package, handle, deliver and store at the job site in a manner that will avoid damage or deformation.
13 Damaged material will be rejected.

14
15 B. Items to be built into concrete, masonry, etc. shall be furnished by the respective contractor and the
16 contractor shall build this into the work as the work progresses.

17
18 1.08 PROJECT CONDITIONS

19
20 A. Verify dimensions in field for pre-cut or prefabricated items.

21
22 B. Examine job conditions and adjoining construction which may affect the acceptability of the work.

23
24 C. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates,
25 and directions for installing embedments and other items that are to be embedded in concrete.
26 Deliver such items to Project site in time for installation.

27
28 1.09 ENVIRONMENTAL REQUIREMENTS

29
30 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
31 site must meet the limitations and restrictions concerning chemical components set by the following
32 standards:

- 33 1. Topcoat Paints, Green Seal Standard GS-11, Paints: First Edition, May 20, 1993.
- 34 2. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints",
35 Second Edition, January 7, 1997. For applications on ferrous metal substrates.
- 36 3. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
37 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
38 January 1, 2004.

39
40 B. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
41 (defined as inside the weatherproofing system and applied on site) must not exceed the following
42 requirements.

- 43 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
44 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
45 2005.
- 46 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
47 effect on October 19, 2000.

48
49
50 PART 2 - PRODUCTS

51
52 2.01 METAL FOR FABRICATIONS

- 1 A. Cold-rolled carbon steel sheets: ASTM A336.
2
3 B. Structural Steel Sheet: Hot rolled ASTM A570, or cold-rolled ASTM A611, of grade required for
4 design loading, minimum of Grade C.
5
6 C. Galvanized carbon steel sheets: ASTM A446, with G90 zinc coating.
7
8 D. Welding materials: AWS D1.1; type required for materials being welded.
9
10 E. Shop coat primer: FS-TT-P-32, for shop application and field touch-up.
11
12 F. Touch-up primer for galvanized surfaces.
13 1. Steel shapes and fasteners, in general, for exterior use and where built into exterior wall: zinc
14 coated.
15
16 G. Structural Steel: ASTM A36.
17
18 H. Hollow Structural Steel Shapes (rectangular and square tubing): ASTM A500 Grade B
19
20 I. Structural Steel Angles: ASTM A36, hot dipped galvanized.
21
22 J. Steel Pipe: ASTM A53, Type S, Grade A, standard weight, schedule 40.
23
24 K. Steel Bars and Bar Size Shapes: ASTM A 306, Grade 65, or ASTM A 36.
25
26 2.02 GALVANIZED STEEL
27
28 A. All exterior galvanized steel shall be hot-dipped galvanized.
29
30 2.03 ACCESSORIES
31
32 A. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM
33 A 47 or cast steel ASTM A 27. Provide bolts, washers and shims as require, hot-dipped galvanized,
34 ASTM A 153.
35
36 B. Fasteners: Including, but not limited to the following;
37 1. Provide zinc-coated fasteners for exterior use where built into exterior walls or where shown
38 on drawings. Select fasteners for the type, grade and class required.
39 a. Provide hot-dipped galvanized coating for fasteners less than 1/2" diameter that are in
40 contact with pressure-treated wood.
41
42 2. Bolts and Nuts: Regular hexhead type, ASTM A 307, Grade A or Type 304 stainless steel,
43 ASTM A 320. High Strength bolts and nuts, ASTM A 325.
44 3. Lag Bolts: Type, FS FF-B-561.
45 4. Machine Screws: Cadmium plated steel, FS FF-S-92, Security Screw
46 5. Wood Screws: Carbon steel, FS FF-S-111.
47 6. Plain Washers: Round, carbon steel, FS FF-W-92.
48 7. Concrete Anchorage Devices: Wedge-type expansion bolts, FS FF-S-325, Group II, Type 4,
49 Class I, zinc coated or stainless steel as shown on the drawings and installed in accordance
50 with manufacturer's recommendations.
51 a. "Kwik-bolt", Hilti Corporation.
52 b. "Wej-it", Wej-it Corporation.
53
54 8. Masonry Sleeve Anchors: zinc coated or stainless as shown on the drawings.
55 a. Rawl "Lok/Bolt".

- 1 b. HILTI - Sleeve anchor.
2
3 9. Toggle Bolts: Spring-wing type, FS FF-B-558, Type I, Class I and Style 1 zinc coated or
4 stainless steel as shown on the drawings.
5 10. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
6 11. Countersunk Washer: Type 316 stainless steel and stainless steel wood screw at solid
7 surface 'panel' ADA vanity enclosure assembly.
8
9 C. Electrodes for Welding: Comply with AWS code.
10
11 2.04 FABRICATION
12
13 A. Weld permanent connections wherever possible; use continuous welds where exposed. Grind
14 smooth all welds where exposed; straighten members after welding.
15 1. Use materials and methods that minimize distortion and develop strength and corrosion
16 resistance of base metals.
17 2. Obtain fusion without undercut or overlap.
18 3. Remove welding flux immediately.
19 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no
20 roughness shows after finishing and contour of welded surface matches that of adjacent
21 surface.
22
23 B. Do shop cutting, drilling, fitting wherever possible. Field measure before fabrication when
24 necessary or required.
25
26 C. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to
27 produce strength and durability in finished product for use intended. Work to dimensions on
28 shop drawings, using proven details of fabrication and support. Use type of materials indicated
29 or specified for various components of work.
30
31 D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp
32 edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form
33 bent-metal corners to smallest radius possible without causing grain separation or otherwise
34 impairing work.
35
36 E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners
37 wherever possible. Use exposed fasteners of type indicated or, if not indicated, security
38 (countersunk) screws or bolts.
39
40 F. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated.
41 Remove sharp or rough areas on exposed surfaces.
42
43 G. Connector plates, tees, brackets and other accessories at exterior wood framing and trim shall be
44 stainless steel.
45
46 2.05 STEEL FINISHES
47
48 A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
49 1. ASTM A 123/A 123M, for galvanizing steel products.
50 2. ASTM A 153/A 153M, for galvanizing steel hardware.
51 3. Except for items indicated to be fabricated of stainless steel, exterior metal fabrication items
52 shall be hot-dip galvanized.
53
54 B. Preparation for Shop Painting: Clean steel items free of mill scale, rust and foreign matter, grease,
55 oil, dust, and dirt in accordance with SSPC SP-2, SP-3, or SP-7.

- 1
2 C. Shop Priming: Apply one shop coat of metal primer using manufacturer's standard primer, except
3 stainless steel, galvanized steel, and other non-ferrous items.
4
5 2.06 STAINLESS-STEEL FINISHES
6
7 A. Remove tool and die marks and stretch lines or blend into finish.
8
9 B. Unless otherwise indicated, grind and polish surfaces to produce uniform finish indicated, free of
10 cross scratches.
11 1. Run grain of directionally textured finishes with long dimension of each piece.
12 2. Directional Satin Finish: No. 4 finish unless noted otherwise.
13
14 C. When finishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and
15 leave surfaces chemically clean.
16
17
18 PART 3 - EXECUTION
19
20 3.01 INSTALLATION
21
22 A. Anchorage to masonry with expansion bolts, sleeves, toggle bolts or approved similar. Do not use
23 wood plugs for anchorage.
24
25 B. Bolts, screws, and similar fastenings for field connections shall be of the same material and finish as
26 the parts being fastened.
27
28 C. Immediately after erection, repaint field connections, weld burns, abraded surfaces. Scrape and wire
29 brush loose and scaling paint to sound metal, follow with spot priming.
30
31 D. Install manufactured units and specialty products in accordance with the manufacturer's instructions
32 and approved shop drawings.
33
34 E. Do not proceed with installation until conditions are satisfactory.
35
36 F. Install in accordance with approved shop drawings.
37
38 G. Perform field welding in accordance with AWS D1.1.
39
40 H. Corrosion Protection: Coat concealed metal surfaces that will come into contact with grout, concrete,
41 or dissimilar metals with a heavy coat of bituminous paint.
42
43 3.02 ADJUSTING AND CLEANING
44
45 A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded
46 areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply
47 with SSPC-PA 1 for touching up shop-painted surfaces.
48 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
49
50 B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair
51 galvanizing to comply with ASTM A 780.
52
53 C. Protect stainless steel finishes from contamination by materials containing iron.
54
55

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SCOPE

- A. Perform all Work required to complete the Rough Carpentry indicated by the Construction Documents, and furnish all items necessary for its proper installation.

1.03 WORK INCLUDED

- A. Wood Blocking, Cants and Nailers.
- B. Plywood Backing Panels.
- C. Sheathing.
- D. This section includes dimensional lumber, minor timber framing, engineered wood products, APA rated sheathing, wood blocking, wood furring, cants, subflooring, underlayment, plywood backing panels.
- E. This section also includes appropriate anchoring and/or fastening devices for wood members, as well as acceptable wood treatment.

1.04 RELATED WORK

- A. Metal Fabrications, Section 05 50 00.
- B. Plastic Laminate-Faced Casework, Section 06 41 16.
- C. Solid Surface, Section 06 61 18.
- D. Plastic Laminate-Faced Casework, Section 06 41 16.
- E. Division 7, Thermal and Moisture Protection

1.05 SUBMITTALS

- A. Submit in accordance to the General Conditions of the contract.
- B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses indicated on the documents. Indicate species and grade selected for each use, and design values approved by American Lumber Standards Committee.
- C. Schedule for completion of rough framing for coordination of templating for shop fabrication of architectural woodwork.

1 D. Wood treatment data as follows, including chemical treatment manufacturer's warranty and
2 instructions for handling, storing, installing, and finishing treated materials:

- 3
4 1. For each type of preservative-treated wood product, include certification by treating plant
5 stating type of preservative solution and pressure process used, net amount of
6 preservative retained, and compliance with applicable standard.
7

8 1.06 REFERENCES
9

10 A. American Forest and Paper Association (AFPA)

- 11 1. AFPA, National Design Specification for Wood Construction.
12 2. AFPA, Design Values for Wood Construction, NDS Supplement.
13

14 B. American Plywood Association (APA)

- 15 1. APA, Plywood Design Specification.
16

17 C. American National Standards Institute (ANSI)

- 18 1. ANSI A190.1, Structural Glued Laminated Wood.
19 2. ANSI A208.1, Material Formed Wood Particle Board.
20

21 D. American Society for Testing and Materials (ASTM)

- 22 1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip), on Iron and Steel
23 Hardware.
24 2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi
25 Tensile Strength.
26 3. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
27 4. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-
28 Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
29 5. ASTM D245 - Standard Practice for Establishing Structural Grades and Related
30 Allowable Properties for Visually Graded Lumber.
31 6. ASTM E84, Test for Surface Burning Characteristics of Building Materials.
32

33 E. American Wood Preservers Association (AWPA)

- 34 1. AWPA C-20, Structural Lumber - Fire Retardant Treatment by Pressure Processes.
35

36 F. American Wood Preservers Bureau (AWPB)

- 37 1. AWPB LP-2, Pressure Treatment with Water-Borne Preservatives.
38

39 G. National Bureau of Standards (NBS)

- 40 1. NBS PS 1, Voluntary Product Standard for Construction and Industrial Plywood.
41 2. NBS PS 20, Voluntary Product Standard for Lumber.
42

43 H. Voluntary Product Standard (PS)

- 44 1. PS 1 - National Institute of Standards and Technology Voluntary Product Standard for
45 Structural Plywood.
46 2. PS 2 - National Institute of Standards and Technology Voluntary Product Standard for
47 Wood-Based Structural-Use Panels.
48 3. PS 20 - National Institute of Standards and Technology Voluntary Product Standard for
49 Softwood Lumber.
50

51 1.07 DELIVERY, STORAGE AND HANDLING
52

53 A. Deliver materials to the site dry and store above ground on level wood blocking, cover from
54 rain, allowing drainage of water from all parts. Handle with care to avoid damage.

- 1
2 B. All installed exposed wood roof nailers, cants, curbs, and similar items shall be protected from
3 moisture until covered with subsequent roofing materials or flashings.
4
- 5 1.08 COORDINATION
6
- 7 A. Correlate location of all framing, furring, blocking, grounds and similar items with all trades.
8
9 B. Verify all dimensions and shop drawing requirements prior to proceeding with work.
10
11 C. Avoid delay of work of other trades dependent on or affected by carpentry work.
12
- 13 1.09 ENVIRONMENTAL REQUIREMENTS
14
- 15 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the
16 building (defined as inside the weatherproofing system and applied on site) must not exceed
17 the following requirements.
18 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
19 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
20 date January 7, 2005.
21 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36,
22 requirements in effect on October 19, 2000.
23
- 24 B. Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and
25 agrifiber products used inside the weatherproofing system shall contain no added urea-
26 formaldehyde resins.
27 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
28 agrifiber assemblies shall contain no added urea-formaldehyde resins.
29
30
- 31 PART 2 - PRODUCTS
32
- 33 2.01 MATERIALS-GENERAL
34
- 35 A. Lumber Standards:
36 1. Dimensional Lumber: Comply with PS 20 and with applicable grading rules of
37 inspection agencies certified by ALSC's Board of Review.
38 a. Each piece of lumber to be factory marked with grade, producing mill and the
39 agency providing inspection services. Where exposed lumber is indicated to have
40 a natural finish or receive stain, grade stamp to be located on the end or back of
41 each piece.
42 b. Moisture content not to exceed 19% for kiln-dry or air-dry lumber.
43
44 2. Wood Structural Panels: Comply with PS 1 or PS 2.
45
- 46 B. Grade and Species:
47 1. Provide dimensional lumber of any species, graded visually or mechanically, and capable
48 of supporting required loads without exceeding allowable design values according to
49 AF&PA's "National Design Specification for Wood Construction" and its "Supplement."
50 2. Lumber grading rules shall be obtained from one of the following agencies:
51 a. NELMA - Northeastern Lumber Manufacturers Association.
52 b. NLGA - National Lumber Grades Authority.
53 c. NSLB - Northern Softwood Lumber Bureau.
54 d. RIS - Redwood Inspection Services.

- e. SPIB - Southern Pine Inspection Bureau.
- f. WCLIB - West Coast Lumber Inspection Bureau.
- g. WWPA - Western Wood Products Association.

C. When nominal sizes are indicated, provide actual sizes required by PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.02 DIMENSIONAL LUMBER

A. Beams, headers, joists, and rafters: Refer to the material specifications listed in the General Notes of the Drawings.

B. Exterior and bearing wall framing: Refer to plans for material specification.

C. Non-load bearing partitions: Standard, stud, or No. 3 of mixed Southern Pine, Hem-Fir, Hem-Fir (North), or Spruce-Pine-Fir.

D. Exposed framing indicated to be a natural finish or receive stain: Provide material free from imperfections with uniformity of appearance. Refer to plans for material specification.

2.03 ENGINEERED LUMBER

A. Provide engineered lumber capable of supporting required loads and meeting or exceeding the bending stress and modulus of elasticity as designated in the General Notes of the Drawings.

B. Available Manufacturers: Subject to compliance with design requirements. Manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

2.04 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA T1 and AWPA U1.

1. Preservative Chemicals:

- a. Alkaline Copper Quat (ACQ-C and ACQ-D)
- b. Inorganic Boron (SBX)
- c. Copper Azole (CBA-A and CA-B)

2. Wood treatment plant shall be experienced in performing work of this section, have specialization in treatment of wood similar to that required for this project, and be licensed by the manufacturer.

B. Kiln dry material after treatment to a maximum moisture content of 19 percent for lumber and 18 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

D. All treated items shall bear an end tag or permanent ink stamp indicating the following:

- 1. Identification of treating manufacturer.
- 2. Type of preservative used.
- 3. Minimum preservative retention (pcf).
- 4. End use for which the product is treated.

- 1 5. Identity of the accredited inspection agency.
2 6. Standard to which the product is treated.
3
4 E. Application: Provide treated wood materials as indicated on the drawings
5
6 F. Wood for nailers, blocking, furring, sleepers and other miscellaneous boards: Construction
7 grade, S4S, dried, 19 percent maximum moisture content. Pressure preservative treat items in
8 contact with flashing, waterproofing, masonry, concrete or the ground.
9
10 G. Wood preservative treatment for wood plates, curbs, cleats, nailing strips, cants, blocking,
11 nailers and similar items for roof deck construction shall be ACQ or other non-arsenate based
12 preservative.
13 1. Oil based preservatives, such as creosote or pentachlorophenol types are not acceptable.
14 2. Paint surfaces, which are cut after treatment with a concentrated solution of the
15 treatment.
16
17 2.05 FIRE TREATED WOOD PRODUCTS
18
19 A. Fire-retardant treated wood products shall be pressure-impregnate wood materials to comply
20 with ASTM E84, Class A and with AWPA C-20 and C-27. Each piece shall bear UL label
21 "FR-S" for 25 maximum flame spread. Moisture content after treatment shall be 19 percent
22 for lumber and 15 percent for plywood.
23 1. Treated materials shall be "Dricon" as manufactured by Koppers Company, Inc.
24 2. Application: Treat all rough carpentry, unless otherwise indicated.
25 a. Concealed blocking.
26 b. Plywood backing panels.
27
28 2.06 WALL SHEATHING
29
30 A. Plywood sheathing shall be ¾-inch thick (or as indicated on drawings), 7-ply, CDX APA
31 Rated, un-sanded with a minimum 24/0 span rating. Sheathing shall be by 48 inches wide by
32 96 inches long.
33
34 2.07 ROOF SHEATHING
35
36 A. Plywood sheathing shall match existing thickness. ¾" or as indicated on drawings, 7-ply,
37 CDX APA Rated, un-sanded with a minimum 24/0 span rating. Sheathing shall be by 48
38 inches wide by 96 inches long.
39
40 2.08 MISCELLANEOUS LUMBER
41
42 A. Grounds, Nailers, Rooftop Equipment Bases and Curbs, Blocking, Cants, Bucks and Shims:
43 Standard, stud, or No. 3 of mixed Southern Pine, Hem-Fir, Hem-Fir (North), or Spruce-Pine-
44 Fir.
45
46 2.09 MISCELLANEOUS FASTNING REQUIREMENTS
47
48 A. Furnish and install all fasteners and anchoring devices for entire project, which shall include
49 items as nails, screws, bolts, anchors, and similar items. Common nails shall be used for all
50 fastening in rough carpentry. Exterior exposed nails and screws shall be hot-dipped
51 galvanized. Bolts shall have standard threads and be complete with washers and nuts.
52 1. Lumber attached to structural steel shall be anchored direct with minimum 1/2" diameter
53 bolts spaced not greater than 24 inches on center, unless noted otherwise on drawings.

- 1 2. Wood assemblies such as wood curbs, top nailers and other built-up members shall be
2 anchored with common nails or wood screws having at least 1-1/2 inch anchoring
3 penetration spaced in two staggered rows at 24 inches on center for each row.
4 3. Miscellaneous nailing shall be at Contractor's discretion for a secure and tight
5 installation.
6 4. Pre-drill holes for all nails larger than 20d. Field drill bolt holes for proper matching and
7 bearing.
8 5. Lead holes for lag screws shall be installed as per NDS Section 9.1.2. Lag screws shall
9 be screwed and not driven into place.
10 6. Bolts shall be installed in holes bored with a bit 1/16 inch larger than the diameter of the
11 bolt. Bolts and nuts seating on wood shall have cut steel washers under heads and nuts.
12 Nuts shall be pulled tight and again checked and tightened just prior to enclosing bolted
13 members. Counterbore for bolted heads or nuts only where so indicated on the drawings,
14 and then only to sufficient depth to house the bolt or head or nut and washer. Cut off
15 excessive bolt projection where necessary. Nick threads to prevent loosening.
16
17 B. Adhesive shall be of proper design and characteristics to rigidly secure materials for which
18 they are used. Adhesive shall be "Titebond VOC-Compliant Heavy Duty Construction
19 Adhesive" conforming with ASTM C557, as manufactured by Franklin International; or
20 approved equal.
21 1. Provide construction adhesive with a VOC content of less than 70 g/l.
22
23 C. Miscellaneous Materials
24 1. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a
25 sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from
26 manufacturer's standard widths to suit width of sill members indicated.
27
28 2.010 FASTENERS
29
30 A. General: Provide fasteners of size and type indicated that comply with requirements specified
31 in this Article for material and manufacture.
32
33 B. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative
34 humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
35
36 C. Nails, Brads, and Staples: ASTM F 1667.
37
38 D. Lag Bolts: ASME B18.2.1.
39
40 E. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property
41 Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
42
43 F. Metal Framing Anchors
44 1. General: Provide framing anchors made from metal indicated, of structural capacity,
45 type, and size indicated, and as follows:
46 a. Approved Manufacturers:
47 1) Simpson Strong-Tie
48 2) USP Structural Connectors
49 3) TECO
50
51 b. Research/Evaluation Reports: Provide products acceptable to authorities having
52 jurisdiction and for which model code research/evaluation reports exist that show
53 compliance of metal framing anchors, for application indicated, with building
54 code in effect for Project.

- 1 c. Allowable Design Loads: Provide products with allowable design loads, as
2 published by manufacturer, which meet or exceed those indicated. Manufacturer's
3 published values shall be determined from empirical data or by rational
4 engineering analysis and demonstrated by comprehensive testing performed by a
5 qualified independent testing agency.
6
7 2. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653,
8 G60 coating.
9

10
11 PART 3 - EXECUTION
12

13 3.01 PREPARATION
14

- 15 A. Examine all adjoining work, verify all governing dimensions, and report any unsatisfactory
16 conditions.
17
18 B. Provide temporary enclosures, partitions, or stairs to properly protect and facilitate the work.
19

20 3.02 GENERAL INSTALLATION
21

- 22 A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and
23 fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.
24 Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements
25 for attaching other construction.
26
27 B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too
28 small to use with minimum number of joints or optimum joint arrangement.
29
30 C. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated
31 lumber and plywood.
32
33 D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated,
34 complying with the following:
35 1. Published requirements of metal framing anchor manufacturer.
36 2. Table 2304.9.1, "Fastening Schedule" in the IBC Code.
37
38 E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully
39 penetrate members where opposite side will be exposed to view or will receive finish
40 materials. Make tight connections between members. Install fasteners without splitting wood;
41 predrill as required.
42
43 F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and
44 fill holes with wood filler.
45
46 G. All installed wood roof nailers, cants, curbs, and similar items shall be protected from
47 moisture until covered with subsequent materials or flashing.
48
49 H. Install materials and systems in accordance with manufacturer's published instructions and
50 requirements. Install materials with uniform appearance and in proper relation with adjacent
51 construction.
52

- 1 I. Cut and frame all lumber into the respective locations, true to line, grade, plumb and level.
2 Form nailers, blockings and bucks to the shape and dimension indicated. Cut and frame all
3 rough carpentry work required by the other sections.
4
- 5 J. Use only sound, thoroughly seasoned materials of longest practical lengths and sizes to
6 minimize jointing. Use materials free from warp which cannot be easily corrected by
7 anchoring and attachment.
8
- 9 K. Treat all wood nailers, sleepers, blocking, furring, other wood in contact with concrete,
10 masonry adjacent to grade or exterior which shall be inaccessible in finished work.
11
- 12 L. Where finish trim is applied directly to framing members or blocking, such members shall be
13 perfectly straight, clear and well seasoned. Warp or other poor characteristics not allowed.
14

15 3.03 WOOD BLOCKING AND NAILER INSTALLATION

- 16
- 17 A. Provide blocking, bucks and framing for all trades as required.
18 1. Blocking to be provided at the following locations:
19 a. All wall hung casework, cabinetry, countertops and shelving.
20 b. All wall hung/mounted equipment, including but not limited to flat screen
21 monitors, brackets, etc. Refer to Electrical Drawings.
22 c. All wall hung writing surfaces
23 d. And as indicated on drawings.
24
- 25 B. Include 2-inch nominal blocking in metal stud partitions required for backing of all
26 accessories, cabinetry, and other surface or recessed items.
27
- 28 C. Install where indicated and where required for attaching other work. Form to shapes indicated
29 and cut as required for true line and level of attached work. Coordinate locations with other
30 work involved.
31
- 32 D. Attach items to substrates to support applied loading. Recess bolts and nuts flush with
33 surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of
34 masonry work. Where possible, secure anchor rods to formwork before concrete placement.
35
- 36 E. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not
37 less than 1-1/2 inches wide and of thickness required to bring face of ground to exact
38 thickness of finish material. Remove temporary grounds when no longer required.
39
- 40 F. Provide solid surfaces at least 1 1/2 inches wide in both directions at all corners for securing
41 finishes.
42

43 3.04 WOOD FRAMING INSTALLATION, GENERAL

- 44
- 45 A. Framing Standard: Comply with AF&PA's "Manual for Wood Frame Construction," unless
46 otherwise indicated.
47
- 48 B. Framing with Engineered Wood Products: Install engineered wood products to comply with
49 manufacturer's written instructions. The design provisions for solid sawn Douglas Fir lumber
50 in the Code are applicable to laminated veneer lumber.
51
- 52 C. Do not splice structural members between supports.
53

54 3.05 WALL AND PARTITION FRAMING INSTALLATION

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- A. General: Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide sill and top plates as indicated in the Drawings. Anchor plates to supporting construction, unless otherwise indicated. Frame wall as indicated on plans.
 - 1. For exterior and bearing walls, provide 2-by-6 inch nominal wood studs spaced 16 inches on center, unless noted otherwise.
 - 2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Fire block concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where fire blocking is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal thick lumber of same width as framing members.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
 - 2. For load-bearing walls, provide studs and headers as indicated on plans.
- D. Provide bracing in exterior walls, at both walls of each external corner, full-story height, unless otherwise indicated. Provide one of the following:
 - 1. Sheathing panels not less than 48 by 96 inches applied vertically.

3.06 HARDWARE

- A. Secure permanently and in proper position all materials with the necessary fastenings to provide the strength and rigidity required to complete the work. Provide washers under bolt heads and nuts in contact with wood.
- B. Bolt nailers and blocking to steel, masonry or concrete members with bolts of proportionate strength of members attached, length required, spaced 2 feet 0 inches on center and 4 inches from each end, except as otherwise indicated. Unless otherwise indicated, anchor bolts shall be 3/8-inch diameter by length required or comparable power actuated fasteners.
- C. Nail plywood in accord with APA recommendations.

3.07 WALL SHEATHING

- A. Place sheathing with all joints over supports. Provide 1 1/2 inch framing at all joints not over supports where blocked joints are noted on Drawings.
- B. Stagger end joints so that joint between adjacent panels occurs over different supports. Allow 1/8 inch spacing between panels on all sides.
- C. Fasten with 8d ring-shank nails at 6 inch on center at all edges and 12 inch on center at all intermediate supports, unless noted otherwise. Sheathing may be stapled with 1 1/2 inch long 15 gauge staples at 4 inch on center at all edges and 12 inch on center at all intermediate supports, unless noted otherwise.
- D. Install in accord with recommendations of APA.

1 3.08 ROOF SHEATHING
2

- 3 A. Place sheathing with face grain at right angles to supports and end joints over supports.
4 Provide 1 1/2 inch framing at all joints not over support where blocked joints are noted on
5 Drawings.
6
- 7 B. Stagger end joints so that joint between adjacent panels occurs over different supports. Allow
8 1/8 inch spacing between panels on all sides.
9
- 10 C. Fasten with 8d ring-shank nails at 6 inch on center at all edges and 12 inch on center at all
11 intermediate supports, unless noted otherwise. Sheathing may be stapled with 1 1/2 inch long
12 15 gauge staples at 4 inch on center at all edges and 12 inch on center at all intermediate
13 supports, unless noted otherwise.
14
- 15 D. Install in accordance with recommendations of APA.
16
- 17 E. All lumber used on this project shall be graded by an agency certified by ALSC. Softwood
18 Lumber: ALSC PS20, grade No. 2 or better; 19 percent maximum moisture content, size as
19 detailed or required.
20
- 21 F. Pressure Treated Plywood and Lumber: These products shall not be specified or provided for
22 use in roofing projects as a substrate material intended to receive mechanical fasteners used to
23 secure metal roof panels, panel clips, metal coping, roof penetration curbs cap and
24 counterflashing, all other metal flashing, roofing insulation and membrane installations that
25 are a part of the roof system.
26
- 27 G. The manufacture shall approve of all mechanical fasteners used to secure all roof system
28 components.
29

30 3.09 TEMPORARY ENCLOSURES
31

- 32 A. The Subcontractor shall furnish, erect, keep in good repair and remove all necessary
33 temporary guard rails, barricades, pedestrian walkways, temporary ladders, building
34 enclosures and partitions (including temporary wood doors hung on temporary wood bucks at
35 exterior door entrances, doors to allow emergency egress by building occupants) and all other
36 necessary temporary enclosures as required as the work progresses.
37

38 3.010 CLEANING
39

- 40 A. Remove from the site all debris resulting from the Work of this Section.
41
42
43

END OF SECTION 06 10 00

SECTION 06 20 00

FINISH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Carpentry work which is exposed to view, non-structural, and not specified as part of other sections.
- B. The types of finish carpentry include, but are not necessarily limited to the following:
1. Wood trim.

1.03 RELATED WORK

- A. Related Sections: The following sections contain requirements that relate to this section:
- B. Metal Fabrications: Section 05 50 00.
- C. Rough Carpentry: Section 06 10 00.
- D. Plastic Laminate Clad Casework: Section 06 41 16, for grommets
- E. Joint Sealants: Section 07 92 00.
- F. Painting: Section 09 90 00.

1.04 SUBMITTALS

- A. General: Submit each item in this article according to the General Conditions of the Contract.
1. Shop drawings for all millwork; receive approval prior to fabrication; draw in related or dimensional position with sections shown either full size or 3-inch scale.
 2. Samples:
 - a. One 6-inch square sample.
- B. Product Data: For each type of component required. Include but not limited to the following:
1. Manufacturer's data on hardware, accessories, and finishes.

1.05 QUALITY ASSURANCE

- A. Quality Standards: Architectural Woodwork Quality Standards, Guide Specification and Quality Control Program as set forth by the Architectural Woodwork Institute (AWI).
- B. Architectural Woodwork Manufacturer: Experienced in this type of work; successfully completed comparable work.
- C. Deviations from quality, grade, species, and finish specified under AWI Interior Woodwork for Transparent Finish and Interior Woodwork for Paint Finish will be allowed for individual items or components only if specified under separate headings covering such items.

1 1.06 DELIVERY, STORAGE AND HANDLING

- 2
- 3 A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage,
4 soiling and deterioration.
- 5
- 6 B. Do not deliver finish carpentry materials until painting, wet work, grinding and similar operations
7 which could damage, soil or deteriorate woodwork have been completed.
- 8
- 9 C. If finish carpentry materials must be stored in other than installation areas, store only in areas
10 meeting requirements specified for installation areas.
- 11 1. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for
12 finish carpentry installation areas. Do not install finish carpentry until required temperature
13 and relative humidity have been stabilized and will be maintained in installation areas.
- 14 2. Maintain temperature and humidity in installation area as required to maintain moisture
15 content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture
16 content, from date of installation through remainder of construction period. The fabricator of
17 woodwork shall determine optimum moisture content and required temperature and humidity
18 conditions.
- 19

20 1.07 ENVIRONMENTAL REQUIREMENTS

- 21
- 22 A. Regional Materials: Provide materials or products that have been extracted, harvested, or recovered,
23 as well as manufactured, within 500 miles of the project site.
- 24 1. Maple 100%
- 25
- 26 B. Certified Wood: Provide 100% of the wood-based materials and products certified in accordance
27 with the Forest Stewardship Council's (FSC) Principles and Criteria.
- 28 1. MDF.
- 29 2. Plywood.
- 30
- 31 C. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
32 site must meet the limitations and restrictions concerning chemical components set by the following
33 standards:
- 34 4. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
35 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
36 January 1, 2004.
- 37
- 38 D. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
39 (defined as inside the weatherproofing system and applied on site) must not exceed the following
40 requirements.
- 41 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
42 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
43 2005.
- 44 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
45 effect on October 19, 2000.
- 46
- 47 E. Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and agrifiber
48 products used inside the weatherproofing system shall contain no added urea-formaldehyde resins.
- 49 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
50 agrifiber assemblies shall contain no added urea-formaldehyde resins.
- 51
- 52

53 PART 2 - PRODUCTS

- 1 2.01 MATERIALS, GENERAL
2
3 A. Lumber standards: Comply with DOC PS 20, “American Softwood Lumber Standard,” for lumber
4 and with applicable grading rules of inspection agencies certified by American Lumber Standards
5 Committee Board of Review.
6
7 B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the
8 following:
9 1. NELMA – Northeastern Lumber Manufacturers Association.
10 2. NHLA – National Hardwood Lumber Association.
11 3. NLGA – National Lumber Grades Authority.
12 4. SPIB - Southern Pine Inspection Bureau.
13 5. WCLIB – West Coast Lumber Inspection Bureau.
14 6. WWPA – Western Wood Products Association.
15
16 C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection
17 agency evidencing compliance with grading rule requirements and identifying grading agency,
18 grade, species, moisture content at time of surfacing, and mill.
19
20 D. For exposed lumber, furnish pieces with grade stamps applied to ends of back of each piece, or omit
21 grade stamps entirely and provide certificates of grade compliance issued by inspection agency.
22
- 23 2.02 SOLID STOCK
24
25 A. Interior: AWI 300 Custom Grade
26 1. Species: Maple, quarter-sawn
27 2. Grade: NHLA – FAS
28 3. Texture: S2S2E, (smooth).
29 4. Size: as indicated on plan
30 5. Finish: All wood bench surfaces to be finishes using a catalyzed polymer lacquer applied in
31 two coats and sealed with hand sanding in between coats and sealed with moisture resistant
32 top coat.
33
- 34 2.03 PLYWOOD AND VENEER:
35
36 A. Interior: AWI 200.
37 1. One side exposed: INT-APA-AC.
38 2. Two sides exposed: INT-APA-AA.
39 3. HPVA HP-1, Premium Grade,
40 4. Species: Maple
41
42 B. Interior: MDF:
43 1. Formadehyde Free.
44 2. Smooth 2 sides.
45 3. Colors and finishes: varied
46
- 47 2.04 SCHEDULE OF MATERIALS
48
49 A. WD-1: Solid (At Self-Serve Kiosk):
50 4. Quarter Sawn Maple.
51 a. Clear Coat.
52
53 B. WP-2: Wood Veneer (at Self-Serve Kiosk):
54 4. Book Matched Maple

- 1 5. Apple Ply or Baltic Birch core.
2 a. Stained to match control sample

3
4 2.05 ACCESSORIES

- 5
6 A. Provide nails, screws and other anchoring devices of the proper type, size, material and finish for
7 application to provide secure attachment, concealed where possible, and complying with applicable
8 Federal Specifications.
9 1. Nails, Wire, Brads and Staples: FS FF-N-105.
10 2. Power-Driven Fasteners: CABO NER-272.
11
12 B. Where interior finish carpentry materials are exposed in areas of high humidity, provide fasteners
13 and anchorages with hot-dip galvanized coating complying with ASTM A 153 or No. 304 stainless
14 steel.
15
16 C. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry
17 use. Exterior rated for exterior use.
18
19 D. Sealants: Comply with requirements of Division 7 Section "Joint Sealants" for materials required for
20 sealing work.
21
22 E. Refer to Section 06 41 16 for grommets.

23
24 2.06 FABRICATION

- 25
26 A. Wood Moisture Content: Comply with requirements of specified inspection agencies and
27 manufacturer's recommendations for moisture content of finish carpentry on relative humidity
28 conditions existing during time of fabrication and in installation areas.
29
30 B. Leave all surfaces clean and true and all exposed wood surfaces sanded parallel with grain, free of
31 discernible marks and ready for work under Division 9 Section "Painting".
32
33 C. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius.
34
35 D. Ease edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.
36

37
38 PART 3 - EXECUTION

39
40 3.01 EXAMINATION

- 41
42 A. Examine substrates, with Installer present, for compliance with requirements for installation
43 tolerances and other conditions affecting installation and performance of finish carpentry. Do not
44 proceed with installation until unsatisfactory conditions have been corrected.
45

46 3.02 PREPARATION

- 47
48 A. Condition wood materials to average prevailing humidity conditions in installation areas prior to
49 installing.
50
51 B. Examine substrate before installation. Verify that substrate is sound and plumb/level. Proceed with
52 installation only after unsatisfactory conditions have been corrected.
53

- 1 C. Wood frame walls shall be dry, clean, sound, well-nailed, free of voids, and without offsets at joints.
2 Ensure that nail heads are driven flush with surfaces. Leave no hammer or automated fastener dents
3 or scuffs.
4
- 5 D. Coordinate woodwork installation with wall flashings and other built-in components.
6
- 7 E. Prime and backprime exterior wood, including cut ends, for painted, stained and oil finish exposed
8 on the exterior. Comply with requirements for surface preparation and application in Division 9
9 Section "Painting".
10
- 11 3.03 INSTALLATION
12
- 13 A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished,
14 inadequately seasoned, or too small to fabricate with proper jointing arrangements.
15 1. Do not use manufactured units with defective surfaces, sizes or patterns.
16
- 17 B. Install finish carpentry plumb, level, true and aligned with adjacent materials. Use concealed shims
18 where required for alignment.
19
- 20 C. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by
21 manufacturer.
22 1. Countersink nails; fill surface flush and sand where face nailing is unavoidable.
23
- 24 D. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry
25 with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal
26 installation.
27
- 28 E. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim
29 and rails.
30 1. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim
31 and rails.
32
- 33 F. Refer to Section 06 41 16 for grommets installation.
34
- 35 G. Finish according to specified requirements.
36 1. Refer to Division 9 Sections for final finishing of finish carpentry.
37
- 38 3.04 ADJUSTING
39
- 40 A. Repair damaged or defective work as directed.
41
- 42 B. Adjust and lubricate hardware for proper operation.
43
- 44 3.05 CLEANING
45
- 46 A. Clean exposed surfaces.
47
- 48 B. Clean shop-finished woodwork, touch-up finish as required and remove and refinish damaged or
49 soiled areas of finish.
50
- 51 C. Protect finish carpentry and maintain conditions necessary to ensure that work will be without
52 damage or deterioration at time of acceptance.
53
54

SECTION 06 41 16

PLASTIC LAMINATE CLAD CASEWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Base, Wall and Custom Storage Cabinets and Adjustable Shelving.
- B. Countertops.
- C. Shelving.
- D. Work Surfaces (with braces beneath).
- E. Hardware.

1.03 RELATED WORK

- A. Rough Carpentry: Section 06 10 00.
- B. Solid Surface: Section 06 61 18.
- C. Joint Sealers: Section 07 92 00.
- D. Plumbing (Sinks, pipe, fittings, final connections, etc.): Division 22.

1.04 REFERENCES

- A. Plastic Laminate: National Electrical Manufacturers Association (NEMA) Publication No. LD3-1991.
- B. Fiberboard Core: ANSI A208.2.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Product Data: Manufacturer's catalog information edited to indicate specific products and related accessories to be provided for this Project.
 - 2. Shop Drawings: Show layout of casework, typical details of construction, and finish selections.
 - a. Locate rough-in for services required and show methods of compensating for minor variations in actual job conditions within specified tolerances.
 - b. Include details of fastening to all other work, countertop layout for each location, details of countertop construction including backsplash, endsplash, and edge details, plastic laminate selections previously made by Architect/Engineer and type of core substrate material.
 - c. Field measure for all countertops.

1 d. Indicate all hardware and keying schedule.
2

3 1.06 QUALITY ASSURANCE
4

- 5 A. Quality Standards: Perform work in accordance with Architectural Woodwork Quality Standards
6 (current edition), Guide Specification and Quality Control Program as set forth by the Architectural
7 Woodwork Institute (AWI).
8
9 B. ANSI/BHMA A156.9 – Cabinet Hardware.
10

11 1.07 DELIVERY, STORAGE AND HANDLING
12

- 13 A. Deliver casework items only when proper storage conditions will be available. Store casework in
14 protected area until ready for installation.
15
16 B. Maintain optimum humidity and temperature conditions after receipt of materials.
17
18 C. Store in manner to allow free circulation of air around all items.
19
20 D. Maintain temperature of casework storage areas between 50 to 75 degrees Fahrenheit.
21
22

23 PART 2 - PRODUCTS
24

25 2.01 CASEWORK
26

- 27 A. AWI Section 400, Custom grade.
28

29 2.02 MANUFACTURERS
30

- 31 A. The following casework manufacturers are acceptable as long as they meet or exceed this
32 specification.
33 1. A.J. Pietsch Company, (414) 342-0531.
34 2. Carley Wood Associates, Inc. (608) 249-7444.
35 3. Central Wisconsin Woodworking, (715) 675-4491.
36 4. Creative Laminates, Inc., (800) 441-5885.
37 5. Diversified Woodcrafts Inc., (920) 842-2136.
38 6. Forestville Builders & Supply Inc., (920) 856-6460
39 7. Glenn Rieder, Inc., (414) 449-2888.
40 8. Hillcraft Ltd., (608) 221-3220.
41 9. Lange Brothers Woodwork Co, Inc., (414) 466-2226.
42 10. Stück Wood Works Inc., (414) 351-5595.
43 11. T. J. Hale Company, (262) 255-5555.
44 12. Techline, (608) 238-6868.
45 13. Wood Design Inc., (920) 563-4833.
46 14. Woodmill Products, Inc., (262) 754-4641.
47 15. Or approved equal.
48
49 B. Hardware manufacturers.
50 1. Doug Mockett & Co. (800) 523-1269.
51 2. A&M Hardware (888) 647-0200
52 3. Or approved equal.
53

- 1 2.03 BASE AND CUSTOM STORAGE CABINETS
2
3 A. Bottoms, Sides and Sub-top: 3/4-inch 45-47 pound density particle board.
4 1. Finish where not exposed: 8 to 11 mil melamine resin overlay.
5
6 B. Back Panel: 3/8-inch 45-47 pound density particle board.
7 1. Finish: 8 to 11 mil melamine resin overlay to match cabinet interior.
8 2. Non-Exposed Side Finish: 8 to 11 mil melamine resin overlay to match.
9 3. If back exposed, provide 3/4-inch material, finished to match.
10
11 C. Top of Base, Custom Storage Cabinet: Full framed wood. Provide full sub-top and 6-inch spreaders
12 between all drawers and door/drawer.
13
14 D. Back panels rabbeted into sides top and bottom. Secure with hot melt glue or glue and mechanical
15 fasteners.
16
17 E. Provide finished end panels at all exposed end locations. Ends adjacent to appliances shall be
18 considered as exposed ends.
19
20 2.04 DOOR/DRAWER CONSTRUCTION AND EDGING
21
22 A. Door/Drawer Fronts: 3/4-inch thick core.
23
24 B. Exposed Edges, Endsplashes: Finished to match exposed face.
25
26 C. Laminate face/balancer to core with PVA rigid adhesives, under pressure, nor natural setting
27 process. Heat process or contact adhesive not allowed.
28
29 D. Door/Drawer/Cabinet Body Edges: 1 mm PVC thru-color, acid resistant hot melt applied.
30
31 2.05 PLASTIC LAMINATE SURFACING
32
33 A. Manufacturers: Wilsonart, Arpa, Formica, Lamin-Art, Nevamar, or approved equal.
34
35 B. Exposed Exterior Surfaces (except countertops): NEMA GP28, 0.028 inch thick, standard vertical
36 grade.
37
38 C. Interior Surfaces/Backing Sheets: NEMA CL20, 0.020 inch thick, standard cabinet liner grade if
39 applicable.
40
41 D. Colors:
42 1. Horizontal Surface Plastic Laminate color to be selected from manufacturer's full range.
43 2. Vertical Surface Plastic Laminate color to be selected from manufacturer's full range.
44 a. PL-1: Horizontal
45 b. PL-2: Vertical
46
47 2.06 DRAWERS
48
49 A. Backs, Sides, Fronts: 1/2-inch thick, medium density fiberboard with melamine overlay.
50
51 B. Dovetail/dado fronts and backs, secure with glue.
52
53 C. Bottoms: 3/8-inch thick.

- 1
2 D. Rabbet bottoms into sides, front and back; staple and glue.
3
4 E. Drawer fronts screwed on from drawer inside.
5
6 F. Reinforcement: 1/2 inch thick under-bottom stiffeners, one at 24 inch drawers, two at 36 inch
7 drawers, four at 48 inch drawers.
8
9 2.07 SHELVES
10
11 A. Shelves under 27 inches long: 3/4-inch thick 45-47 pound density particle board.
12
13 B. Shelves over 27 inches long: 1 inch thick 45-47 pound density particle board.
14
15 C. Finish: Finished to match faces.
16
17 D. Edging: 1 mm PVC thru-color, acid resistant, hot melt applied.
18
19 2.08 BASES
20
21 A. Two, continuous, 4-inch high by 1-1/2-inch thick lumber, or 4-inch high by 3/4 inch exterior grade
22 plywood, 2 foot on center.
23
24 B. Provide two positioning strips to cabinet bottom for concealed fastening.
25
26 2.09 COUNTERTOPS
27
28 A. Plastic Laminate: 1-1/2 inches thick 45-47 pound density particle board, NEMA GP50 finish top and
29 edges, exposed underside and NEMA CL20 backer sheet.
30 1. Square front edge, back and side splashes. Provide cutouts for built-in fixtures.
31
32 B. Bracket for Worksurface (with no Base Cabinet):
33 1. Manufacturers:
34 a. Hafele, Hegbo bracket: 150 kg load per bracket or similar by Robinson Steel Co.,
35 12"x18"
36 b. Location as indicated on plan
37 c. Color: As selected from manufacturer's full range
38
39 2.010 HARDWARE
40
41 A. Pulls: Doug Mockett & Co. 5 21/32" Aluminum Extrusion Pull – DP117B, Satin Aluminum.
42
43 B. Self-Closing Hinges: Blum Model 71.6530 with 175L8100 base plate.
44
45 C. Drawer Slides: Accuride or approved equal.
46
47 D. Locks:
48 1. Cabinet Locks: Keyed to match, five pin. All casework to be lockable. Key casework alike
49 per area.
50 2. Custom Storage Cabinet Locks: Hafele, Safe-o-Mat Coin Return Locks.
51
52 E. Steel Brackets (for upper shelving): A&M Hardware or approved equal
53 1. Color: To be selected by Architect from full line of powder coat finishes.

- 1
2 F. Hardware finish: 626 (US26D) Brushed Chrome.
3
4 G. Keyboard Platform: Doug Mockett & Co., "KP1", adjustable type with non-skid pads and gel wrist
5 pad. Mouse Support: Doug Mockett & Co., "KPA1".
6
7 H. Grommet: Mockett, Max1/A
8 1. Install every 3'-0" in worksurfaces (without base cabinet) and Self-Serve Kiosk..
9
10 2.011 WORKMANSHIP
11
12 A. Cabinet parts shall be accurately machined utilizing hardwood dowels for premium quality grade
13 joinery construction. Glue and mechanically fasten all joints for maximum rigidity.
14
15 B. All cases shall be square, plumb, true and self-supporting.
16
17 C. Provide removable back panels and closure panels for plumbing access where shown on Project
18 Drawings.
19
20
21 PART 3 - EXECUTION
22
23 3.01 DELIVERY
24
25 A. Store and install in a ventilated building not exposed to extreme temperature and/or humidity.
26
27 3.02 INSTALLATION
28
29 A. Installation shall be by the manufacturer's authorized representatives using factory trained personnel
30 experienced in the installation of this type of equipment.
31
32 B. Uncrate, set up, place, level, scribe and anchor all cabinets according to manufacturer's
33 recommendations.
34
35 C. Remove and replace tops, backs, panels, shelves and other items necessary to allow other Sections to
36 complete their work of connecting services.
37
38 D. Do all cutting, boring, patching required for the installation of work of other Sections.
39
40 E. Provide all necessary fillers, panels, end panels, scribes required to make complete installation as
41 detailed.
42
43 F. Where casework meets wall surfaces, set with uniform space not to exceed 1/8-inch. Seal all joints
44 with silicone sealant to a slightly concave joint, using backer rod where required. Apply sealant in
45 accord with Section 07 92 00.
46
47 G. Cabinets with surfaces having machine or tool marks will be rejected.
48
49 H. All finishes must be smooth, uniform in color and match approved sample.
50
51 I. Prior to final inspection, examine installation of the work of this Section. Repair or replace all
52 defects found. Leave installation clean, undamaged and ready for use.
53

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2

END OF SECTION 06 41 16

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SECTION 06 61 18
SOLID SURFACE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Solid surface countertops and caps.
- B. Solid surface mounting brackets.

1.03 RELATED WORK

- A. Rough Carpentry: Section 06 10 00.
- B. Gypsum Wall Board Section 09 29 00.

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
 - 1. Product Data: Manufacturer's catalog information edited to indicate products to be provided for this Project.
 - a. Joint adhesives or mastics, color matched.
 - b. Joint sealants.
 - c. Fastening adhesive
 - 2. Samples:
 - a. Product Data.
 - b. Solid surface sheet material.
 - c. Include color chart showing full range of available colors for sheet

1.05 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Minimum three years experience in fabrication and installation of solid surface materials or certification by Distributor.
 - 1. Qualifications: Proof of fabricator qualifications.
 - 2. Certificates: Copies of ISO certifications.
 - 3. Test Reports:
 - a. Flammability test reports.
 - b. Food preparation zone use test reports.
 - 4. Manufacturer's Fabrication and Installation Manual.
 - 5. Manufacturer's Fabrication and Installation Check List.

- B. Shop Drawings: Provide plans, sections, and large-scale details. Include attachment provisions and fabrication methods.

1.06 WARRANTY

1 A. Provide manufacturer's standard 10 year warranty against defects in workmanship.

2

3 1.07 MAINTENANCE

4

5 A. Extra Materials: Provide for future repair use by Owner.

6 1. Minimum 4 sf per 50 lf of each countertop color.

7

8 1.08 SPECIAL INSTRUCTIONS

9

10 A. Do not deliver components to project site until spaces are ready for installation.

11

12 1.09 ENVIRONMENTAL CONDITIONS

13

14 A. Installation spaces must be maintained at normal occupancy temperature and humidity levels for
15 minimum 72 hours prior to and continuously following installation.

16

17 1.010 ENVIRONMENTAL REQUIREMENTS

18

19 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
20 site must meet the limitations and restrictions concerning chemical components set by the following
21 standards:

22 1. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
23 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
24 January 1, 2004.

25

26 B. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
27 (defined as inside the weatherproofing system and applied on site) must not exceed the following
28 requirements.

29 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
30 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
31 2005.

32 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
33 effect on October 19, 2000.

34

35

36 PART 2 - PRODUCTS

37

38 2.01 MATERIALS

39

40 A. Solid Surface

41 1. SLS-1 (Kitchen, 113 and Conference/Nursing Mother, 126)

42 a. Formica, Solid Surfacing

43 b. Or approved equal by: Dupont, Corian; Wilsonart, Solid Surfacing.

44

45 2. SLS-2 (Reception, 128).

46 a. Formica, Solid Surfacing

47 b. Or approved equal by: Dupont, Corian; Wilsonart, Solid Surfacing.

48

49 B. No cracked, chipped, broken, stained, or defective material will be accepted.

50 1. Materials fabricated to thickness and size shown on drawings.

51 a. All sizes to be field verified.

52

53 C. Color Match Differences: Minimal.

- 1
2 D. Adhesives: Use manufacturer's recommended adhesives, and installation instructions. See product
3 fabrication manuals for application techniques and surface preparation.
4 1. Chroma must be mechanically fastened.
5
6 2.02 MOUNTING BRACKETS
7
8 A. Solid Surface Countertop Mounting Bracket
9 1. Basis of Design: Rakks®, EH 1818 Inside Wall-Flush Mount.
10 a. Or approved equal.
11
12 2.03 FABRICATION
13
14 A. Field verify measurements.
15
16 B. Finished Surfaces: Uniform as chosen by A/E from full range with all edge profiles as shown on
17 drawings.
18
19 C. Color and finish: To be selected by Architect from full range of colors and finishes.
20
21
22 PART 3 - EXECUTION
23
24 3.01 EXAMINATION
25
26 A. Examine countertops, surfaces and cabinets upon which countertops will be installed. Coordinate
27 with cabinet specification section to assure that cabinets are set to the following tolerance or better.
28 1. Verify that cabinets are level to 1/8 in. in 10 ft.
29 2. Review manufacturer's Fabrication and Installation Check List.
30
31 B. Examine walls upon which base will be installed.
32 1. Verify wall is flat and acceptable for base application.
33 2. Review manufacturer's Fabrication and Installation Check List.
34
35 C. Coordinate with responsible entity to correct unsatisfactory conditions.
36
37 D. Commencement of work by installer is acceptance of conditions.
38
39 3.02 INSTALLATION
40
41 A. Install fabricated items according to material manufacturers printed instructions.
42
43 B. Set all items square and true with edges of face joints smooth, even, neat and tight against other
44 materials.
45
46 C. Countertop Bracket Installation
47 1. Maximum spacing 48-inches on center. Space brackets 32" when installing into metal studs
48 or in any application where just two screws are securing the bracket to the wall.
49 2. Inside wall brackets 2" x 2" x 1/4" L-shaped vertical leg is to be screwed to the right side of
50 the stud.
51 3. Metal studs must have additional wood blocking placed inside the stud for maximum
52 strength. Drill through the stud and wood blocking and secure with 1/4-20 x 2" bolts and
53 4. nuts.

- 1 5. After installation of the bracket, drywall is mounted to the studs, hiding the vertical
- 2 support leg.
- 3 6. Properly prepare GWB and seal at horizontal bracket.
- 4 7. Refer to manufacturer’s installation instructions.
- 5
- 6 3.03 PROTECTION, REPAIRING AND CLEANING
- 7
- 8 A. Replace damaged and defective work.
- 9
- 10 B. Clean according to manufacturer's directions. Use no acids or harsh abrasives.
- 11
- 12
- 13

END OF SECTION 06 61 18

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Batt Insulation.
B. Vapor Retarder.
C. Insulation Accessories.

1.03 RELATED WORK

- A. Section 07 28 00, Water-Resistive Barriers
B. Section 09 29 00, Gypsum Board (Sound Attenuation)

1.04 SUBMITTALS

- A. General: Submit each item in this article according to the Conditions of the Contract and Division 1 Specification Sections.
1. Manufacturer's Data: Submit manufacturer's data for each type of insulation required. Include data substantiating that the materials comply with specified requirements, including GreenGuard Certification.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in unopened packages, with identification labels intact.
B. Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
C. Protect plastic insulation against ignition at all times.
D. Remove damaged materials from site.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as inside the weatherproofing system and applied on site) must not exceed the following requirements.
1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on October 19, 2000.

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PART 2 - PRODUCTS

2.01 INSULATION TYPE 1: BATT INSULATION

- A. Batt Insulation:
 - 1. Unfaced Fiberglass batts per ASTM C665, Type I. Thickness as indicated on Drawings.
 - a. Provide batt insulation that is a GreenGuard Indoor Air Quality Certified, low-emitting product.
 - b. Manufacturers: CertainTeed, Guardian, Knauf, Owens Corning, or approved equal.
 - 2. Vapor Retarder:
 - 1. Class II, tested in accordance with ASTM E 96.
 - 2. 4 mil clear polyethylene.
- C. Vapor Retarder Tape: As recommended by vapor retarder manufacturer.

2.02 SPRAYED POLYURETHANE FOAM SEALANT

- A. Single-component polyurethane foam sealant for sealing cracks, gaps around openings and joints between other materials so as prevent air infiltration and water penetration. Provide products that have a VOC content of less than 250 g/l.
 - 1. Manufacturers:
 - a. OSI, Green Series, "Pro Foam II Minimally Expanding Sealant".
 - b. Dow, "Great Stuff Gaps and Cracks.
 - c. Soy Seal for Gaps & Cracks.
 - d. Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which insulation work is to be performed. Do not proceed with insulation work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections, which might puncture vapor barriers.

3.03 INSTALLATION

- A. General
 - 1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding.
 - 2. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

- 1 3. Apply a single layer of insulation to required thickness, unless otherwise shown or
2 required to make up total thickness.
- 3 4. Supply and install manufacturer recommended construction tape over all joints in rigid
4 insulation per manufacturer's instructions.
- 5
- 6 B. Blanket Insulation
- 7 1. Install blanket with vapor retarder to warm side of wall.
- 8 2. Use loose blanket insulation to tightly seal all cracks, openings, spaces causing drafts into
9 heated spaces at furred ceiling, tops of walls, door rough openings, at deck and joist bearing
10 on perimeter walls, etc.
- 11 3. Use to close space around ducts where they pass through walls.
- 12 4. Install ventilation baffles per manufacturer's instructions.
- 13 5. Provide insulation supports at horizontal applications where friction fit is not adequate to
14 hold insulation in proper position.
- 15
- 16 C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to
17 prevent gaps in insulation using the following materials:
- 18 1. Batt Insulation: Compact to approximately 40 percent of normal maximum volume equaling
19 a density of approximately 2.5 lb/cu. ft.
- 20 2. Spray Polyurethane Foam Sealant: Apply according to manufacturer's written instructions.
- 21
- 22 3.04 INSTALLATION OF VAPOR RETARDERS
- 23
- 24 A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission.
25 Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to
26 cover miscellaneous voids in insulated substrates, including those filled with loose-fiber
27 insulation.
- 28
- 29 B. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners.
- 30
- 31 C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor
32 retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor
33 retarder.
- 34
- 35 D. Repair tears or punctures in vapor retarders immediately before concealment by other work.
36 Cover with vapor-retarder tape or another layer of vapor retarder.
- 37
- 38 E. Vapor retarder shall be installed in maximum material sizes so as eliminate intermediate
39 horizontal joints and to achieve a minimum vertical joint spacing of 90-feet. The vertical joints
40 shall have 12-inch overlaps and shall include two continuous runs of specified tape. The tape
41 shall be used at the top and bottom seals.
- 42
- 43 3.05 PROTECTION
- 44
- 45 A. Protect installed insulation and vapor barriers from harmful weather exposures and physical
46 abuses, by non-delayed installation of concealing work or, where that is not possible, by
47 temporary covering or enclosure.
- 48
- 49
- 50
- END OF SECTION 07 21 00

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SECTION 07 28 00

WATER-RESISTIVE BARRIERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. This Section specifies water-resistive barriers and accessories for Metal Wall Panels and Mineral-Fiber-Reinforced Cementitious Panels.
- B. Include self-adhesive strips for use of over exposed areas of substrates at open joints of fiber cement panels.

1.03 REFERENCE STANDARDS

- A. Air Barrier Association of America (ABAA)
1. ABAA [2011], Installer’s Certification Program.
 2. ABAA [2012], Water-resistive Barrier Installation Guideline.
- B. American Association of Textile Chemists and Colorists (AATCC)
1. AATCC 42 [2007], Water Resistance: Impact Penetration Test.
- C. ASTM International (ASTM).
1. ASTM D882-[2010], Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 2. ASTM E84-[2010b], Standard Test Method for Surface Burning Characteristics of Building Materials.
 3. ASTM E96/96M-[2010], Standard Test Methods for Water Vapor Transmission of Materials.
 4. ASTM E2178-[2003], Standard Test Method for Air Permeance of Building Materials.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.
- B. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and one week prior to commencing work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer’s written installation instructions.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- A. Product Data: Submit product data including manufacturer’s literature for water-resistive barrier membrane and accessories, indicating compliance with specified requirements and material characteristics.

- 1 1. Submit list on water-resistive barrier manufacturer's letterhead of materials, components
- 2 and accessories to be incorporated into Work.
- 3 2. MSDS report.
- 4 3. Include product names, types and series numbers.
- 5 4. Include contact information for manufacturer and their representative for this Project.
- 6
- 7 B. Samples:
- 8 1. Submit duplicate 12 x 12 inches sample of membrane.
- 9 2. Submit duplicate 12 inches long samples of seam tape and each type of flashing
- 10 materials.
- 11
- 12 C. Test Reports:
- 13 1. Submit test reports showing compliance with specified performance characteristics and
- 14 physical properties including air permeance, water vapour permeance and structural
- 15 performance.
- 16
- 17 D. Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer
- 18 representative's site visit and inspection.
- 19
- 20 E. Installer Qualifications:
- 21 1. Submit letter verifying installer's experience with work similar to work of this Section.
- 22

23 1.06 CLOSEOUT SUBMITTALS

- 24 A. Operation and Maintenance Data: Supply maintenance data for water-resistive barrier materials.
- 25
- 26 B. Warranty: Submit warranty documents specified.
- 27
- 28

29 1.07 QUALITY ASSURANCE

- 30
- 31 A. Installer Quality Assurance: manufacturer's approval of installer or [2] years' experience with
- 32 work similar to work of this Section or ABAA certification.
- 33

34 1.08 DELIVERY STORAGE AND HANDLING

- 35
- 36 A. Delivery and Acceptance Requirements:
- 37 1. Deliver materials and components in manufacture's original packaging with
- 38 identification labels intact and in sizes to suit project.
- 39
- 40 B. Storage and Handling Requirements: Store materials off ground and protected from exposure to
- 41 harmful weather conditions and at temperature conditions recommended by manufacturer.
- 42 1. Ensure materials are protected from sunlight and UV radiation.
- 43

44 1.09 WARRANTY

- 45
- 46 A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- 47
- 48 B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty
- 49 document executed by authorized company official. Manufacturer's warranty is in addition to and
- 50 not intended to limit other rights Owner may have under Contract Conditions.
- 51 1. [10] years limited material warranty.
- 52
- 53 C. Warranty period: [1] years commencing on Date of Substantial Performance of Work.

1
2
3 PART 2 PRODUCTS

4
5 2.01 MANUFACTURER

- 6
7 A. Basis of Design: Manufacturer: Cosella-Dörken Products Inc., 4655 Delta Way, Beamsville,
8 Ontario, L0R 1B4, Canada, Phone: 1-905-563-3255, Toll Free: 1-888-4DELTA4 (1-888-433-
9 5824), e-mail: info@cosella-dorken.com , URL: <http://www.cosella-dorken.com>.
10
11 B. Vaproshield Revealshield SA Self Adhered.
12
13 C. Or approved equal.
14

15 2.02 DESCRIPTION

- 16
17 A. Vapor permeable water-resistive barrier with highly tear-resistant thermo-bonded non-woven
18 polyester substrate, and waterproof acrylic highly UV resistant coating.
19 1. Include factory applied self-adhesive strip at longitudinal edges of barrier membrane.
20 2. Include self-adhesive strips for use of over exposed areas of substrates at open joints of
21 fiber cement panels.
22

23 2.03 DESIGN CRITERIA

- 24
25 A. Water Vapor Permeance: To ASTM E96 (Procedure A), 204 perms minimum.
26
27 B. Water Impact Penetration Resistance: To AATCC 42, no water passing.
28
29 C. Air Permeance: To ASTM E2178, 0.9 L/(s x m²) @ 75 Pa.
30
31 D. Tear Resistance: To ASTM D 1922, [1916] [2564] g minimum.
32
33 E. Dry Tensile Strength: To ASTM D882, MD 47.4 lb/in², CD 28.7 lb/in² minimum.
34
35 F. Elongation at Break: To ASTM D882, MD 40 %, CD 45 % minimum.
36
37 G. Fire Rating Characteristics to ASTM E84:
38 1. Rating: NFPA Class A, IBC Class A minimum.
39 2. Flame Spread: 10 maximum.
40 3. Smoke Developed: 145 maximum.
41

42 2.04 MATERIALS

- 43
44 H. Water-resistive Barrier for Walls: Vapor permeable water-resistive barrier with tear-resistant
45 thermo-bonded, non-woven polyester substrate and waterproof acrylic polymeric coating
46 stabilized against oxidation and UV degradation and factory applied adhesive edge strips.
47 1. Service Life Expectancy: > 25 years.
48 2. Weight: 5.5 lb/100 ft², 270 g/m², 44 lb/roll nominal.
49 3. Roll Dimensions: 4' 11" x 164".
50 4. Color: Black
51

52 2.05 ACCESSORIES

- 1 A. Seam tape: In accordance with water-resistive barrier manufacturer’s written recommendations.
- 2 1. Acceptable materials: Cosella-Dörken Products Inc., DELTA®-FASSADE TAPE (2-
- 3 1/2” x 65’ 7”)
- 4
- 5 B. Flashings: Self-adhering, water-resistive flashing membrane in accordance with water-resistive
- 6 barrier manufacturer’s written recommendations and in accordance with Section 07 65 00 –
- 7 Flexible Flashing.
- 8 1. Acceptable materials: Cosella-Dörken Products Inc., DELTA®-FASSADE FLASHING
- 9 or approved equal.
- 10
- 11 C. Fasteners: Water and vapour resistant fasteners in accordance with water- resistive barrier
- 12 manufacturer’s written recommendations.
- 13
- 14 D. Sealants and Adhesives: Elastomeric sealant and adhesive in accordance with water-resistive
- 15 barrier manufacturer’s written recommendations.
- 16 1. Ensure sealants are UV resistant and compatible with adjacent materials.
- 17 2. Acceptable materials: Cosella-Dörken Products Inc., DELTA®-THAN.
- 18
- 19 E. Primers: In accordance with flashing manufacturer’s written recommendations.
- 20

21 2.06 PRODUCT SUBSTITUTIONS

- 22
- 23 A. Ensure all accessories such as seam tape, flashing membranes, fasteners and sealants come from
- 24 same source as water-resistive barrier membrane.
- 25

26

27 PART 3 EXECUTION

28

29 3.01.1 INSTALLERS

- 30
- 31 A. Use only manufacturers authorized installers or installers with 2 years minimum experience in
- 32 work or ABAA certified installers for work of this Section.
- 33

34 3.02 EXAMINATION

- 35
- 36 A. Verification of Conditions: Verify that conditions of substrate previously installed under other
- 37 Sections or Contracts are acceptable for water-resistive barrier installation in accordance with
- 38 manufacturer’s written recommendations.
- 39 1. Visually inspect substrate in presence of Consultant.
- 40 2. Inform Consultant of unacceptable conditions immediately upon discovery.
- 41 3. Proceed with installation only after unacceptable conditions have been remedied and after
- 42 receipt of written approval to proceed from Consultant.
- 43

44 3.03 PREPARATION

- 45
- 46 A. Ensure step flashings and kick-out flashings are installed before beginning installation of water-
- 47 resistive barrier membrane.
- 48
- 49 B. Ensure protrusions that may penetrate water-resistive barrier membrane are removed before
- 50 beginning installation.
- 51

52 3.04 INSTALLATION

- 1
- 2 A. Install water-resistive barrier before installation of windows and doors in accordance with
- 3 manufacturer's written recommendations.
- 4
- 5 B. Do installation in accordance with ABAA written recommendations for installation of water-
- 6 resistive barriers.
- 7
- 8 C. Unroll water-resistive barrier with printed side out, wrapping entire building, including rough
- 9 openings for windows, doors and other protrusions or penetrations.
- 10 1. Install water-resistive barrier plumb and level to exterior face of substrate or directly to
- 11 framing members in accordance with manufacturer written recommendations.
- 12 2. Ensure water-resistive barrier is installed with textured side facing substrate.
- 13
- 14 D. Start installation of water-resistive barrier at building corner, leaving 6"-12" of membrane
- 15 extended beyond corner.
- 16
- 17 E. Install horizontally starting at bottom of wall.
- 18 1. Overlap water-resistive barrier membrane as follows:
- 19 2. Exterior Corners: [12] inches minimum.
- 20 3. Vertical and horizontal seems: [6] inches minimum.
- 21 4. Other seams, joints or at protrusions and penetrations: [6] inches minimum.
- 22
- 23 F. Sill Plate Interface: Extend lower edge of water-resistive barrier over sill plate interface 3"- 6".
- 24 1. Secure to substrate with elastomeric sealant in accordance with water-resistive barrier
- 25 manufacturer's written recommendation.
- 26
- 27 G. Attachment of Water-resistive Barrier Membrane to Substrate:
- 28 1. Attach water-resistive barrier to steel studs through exterior sheathing with mechanical
- 29 fasteners and elastomeric adhesive in accordance with manufacturer's written
- 30 recommendations.
- 31

32 3.05 FIELD QUALITY CONTROL

- 33
- 34 A. Field Inspection: Coordinate field inspection as required for manufacturer's assurance of
- 35 installation in compliance with manufacturer's requirements.
- 36

37 3.06 CLEANING

- 38
- 39 A. Progress Cleaning: Perform cleanup as work progresses.
- 40
- 41 B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- 42

43 3.07 PROTECTION

- 44
- 45 A. Protect installed products and components from damage during construction.
- 46
- 47 B. Repair damage to adjacent materials caused by water-resistive barrier installation.
- 48
- 49

50 END OF SECTION 07 28 00

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SECTION 07 31 13

ASPHALT SHINGLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Granular surfaced asphalt shingle roofing.
- B. Eave and ridge protection.
- C. Ventilating Ridge Vents.
- D. Metal gable and eave
- E. Metal flashing for this Section.
- F. Waterproofing underlayment and roofing felt.

1.03 RELATED WORK

- A. Rough Carpentry, Section 06 10 00
- B. Insulation, Section 07 21 00
- C. Flashing and Sheet Metal, Section 07 62 00

1.04 REFERENCES STANDARDS

- A. APA – American Plywood Association.
- B. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- C. ASTM D3018 - Class A Asphalt Shingles Surfaced with Mineral Granules.
- D. ASTM D3161 - Wind-Resistance of Asphalt Shingles.
- E. ASTM D3462 - Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- F. ASTM D4586 - Asphalt Roof Cement, Asbestos Free.
- G. NRCA - Roofing and Waterproofing Manual.
- H. UL - Fire Hazard Classifications.

1.05 WARRANTY:

- 1 A. Shingles are to have the following warranty: 30 years from the date of Substantial Completion,
2 prorated, with first 5 years non-prorated.
3
- 4 B. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds
5 up to 70 mph for 5 years from date of Substantial Completion.
6
- 7 C. Guarantee: Provide written guarantee warranting all roofing and flashing required under contract, to
8 be watertight and free from defects in materials or workmanship for period of time, as stipulated in
9 guarantee form. A copy of the required guarantee form is appended hereto.
10
- 11 D. Manufacturer's Guarantee: Provide shingle manufacturer's thirty (30) year guarantee against material
12 defects and wind damage.
13
- 14 E. Manufacturer warranty coverage shall include a minimum of twelve (12) years non-prorated protection
15 including cost of labor (Contractor certified by manufacturer) to remove and replace part or all of the
16 shingle system affecting performance, include replacement of any or all manufacturer products and
17 components included in the system warranty through the non-prorated and prorated duration of the
18 warranty. A minimum of four (4) manufacturer products area required to achieve the specified
19 manufacturer warranty to include shingles, shingle starter course, self adhering leak barrier, hip or
20 ridge cap and ridge vent.
21
- 22 F. The Contractor shall acquire current proof of manufacturer certification for the product to be installed
23 on the project and submit such dated certification status to DSF along with the product submittal
24 package.
25 1. Provide all additional products, materials not specifically mentioned herein and their installation
26 as required by manufacturer recommendations and/or system guarantee instructions, to obtain
27 complete guarantee coverage for the project as required by this specification.
28

29 1.06 QUALITY ASSURANCE

- 30
- 31 A. Roofing systems shall be applied by qualified roofing contractors. Within the past five (5) years, the
32 contractor shall be able to document the successful completion of a minimum of three (3) projects of
33 similar size and scope of the work specified in this Section.
34
- 35 B. Provide all equipment recommended by the manufacturer for proper installation of the materials
36 specified.
37
- 38 C. Roofing installations shall comply with fire resistive rating as defined in the Wisconsin Administrative
39 Code. Required rating on these roofs: U.L. Class A.
40
- 41 D. Prior to the start of construction, it is required that the Contractor's superintendent or foreman attend
42 the preconstruction/preinstallation meeting(s).
43

44 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- 45
- 46 A. Make no deliveries to the project site until ready to install or approved storage is provided. The City
47 of Madison will not accept delivery nor will the City of Madison be responsible for any materials or
48 equipment stored on the premises.
49
- 50 B. Deliver materials in the manufacturer's original, unopened containers and rolls with labels intact and
51 legible. Deliver materials in sufficient quantity to allow continuity of work.
52
- 53 C. Materials used on the job must be stored in such a manner as not to create a nuisance or hazard.
54

- 1 D. Store materials on clean, raised platforms, with breathable, weather protective covering when stored
2 outdoors. Provide continuous protection from materials against weathering and moisture absorption.
3
4 E. Factory applied "shrink-wrapping" is not considered to be an acceptable weather protective covering.
5 Store rolled goods on end; do not double stack rolls. Improper storage practices will be grounds for
6 rejection of questionable materials.
7
8 F. Store primers, coatings, sealants and similar materials between 60 degrees and 80 degrees Fahrenheit.
9
10 G. DO NOT store materials in a manner which will overload any portion of the building.
11
12 H. Handle all materials in a manner which will not damage the material. All damaged materials shall be
13 removed from project site.
14
15 I. Select and operate material handling equipment and store materials as not to damage existing
16 construction or applied roofing, and without overloading the building structural system.
17

18 1.08 SUBMITTALS
19

- 20 A. At or before the preconstruction meeting and prior to start of work, submit manufacturer's product data
21 and installation instructions for each of the following:
22 1. Each type and size of asphalt shingles.
23 2. Water proofing underlayment.
24 3. Ridge vent.
25 4. Current proof of manufacturer certification for the product to be installed on the project and
26 submit such dated certification status to DSF along with the product submittal package.
27
28 B. Samples for initial selection showing full range of colors, textures and profiles available.
29

30 1.09 SITE CONDITIONS
31

- 32 A. Apply roofing in dry weather. All roofing materials installed during rain shall be removed and
33 replaced with dry materials at Contractor's expense.
34
35 B. DO NOT apply roofing unless authorized by the Architect/Engineer when the working hours ambient
36 temperature is below 32 degrees Fahrenheit. Under no circumstances will any seaming, flashing or
37 adhesive activities be allowed when the ambient temperature is below 20 degrees Fahrenheit, or the
38 wind chill factor is below 0 degrees Fahrenheit.
39
40 C. Disposal of materials:
41 1. All materials to be disposed of shall be loaded directly into trucks by means that will prevent
42 damage to existing or new surfaces and to control pollution. Free-fall of debris from heights
43 over 15' will not be allowed.
44
45

46 PART 2 - PRODUCTS
47

48 2.01 SHINGLES
49

- 50 A. Products for this Section shall be from a single source. Subject to compliance with requirements,
51 products of the following manufacturers may be used that meet the specification:
52 1. Certaineed
53 2. GAF
54 3. Owens Corning

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13
- B. Shingles:
 - 1. Basis of Design: Certainteed, Landmark® Pro
 - a. 50-year limited transferable warranty against manufacturing defects on group-owned or commercial applications
 - b. 15-year StreakFighter® algae-resistance warranty
 - c. 10-year SureStart™ protection
 - d. 15-year 110 mph wind-resistance warranty
 - e. Wind warranty upgrade to 130 mph available.
 - f. CertainTeed starter and CertainTeed hip and ridge required
 - 2. Color: As selected by A/E from manufacturer's full line of colors.

- 14
15
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17
18
19
- C. Rating of shingle: Class A rating per UL 997, ASTM D3018, Type 1; ASTM D3161; ASTM D3462 at the time of installation; fire and wind resistant roofing shingles as follows:
 - 1. Laminated: Self-sealing, 12" x 36", metric size 13-1/4" x 38-3/4" or similar with shingle exposure to the weather per manufacturer instructions. Each lamination shall have a minimum tear resistance of 1450 grams when tested in accordance with ASTM D3462.

- 20
21
- D. Shingles shall be purchased from one lot at one time. Do not mix lots on one exposure of roof.

22 2.02 ACCESSORIES

- 23
24
25
26
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28
29
30
31
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41
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43
- A. Roofing Felt Underlayment: 15#, asphalt saturated, non-perforated, organic roofing felt, complying with ASTM D 226, Type 1, 36" wide.
 - B. Waterproofing Underlayment: Polyethylene surfaced, self adhering modified bitumen type, 30#, equal to "Ice & Water Shield" as manufactured by W.R. Grace, GAF Weather Watch or approved equal.
 - C. Nails to be standard wire roofing nails, Hot-dip galvanized or cadmium plated roofing nails with 11 or 12 gauge shank and 3/8" head and of length sufficient to penetrate 3/4" roof sheathing.
 - 1. Fasteners at eaves shall be sized to not penetrate the exposed face of the cedar, T&G sheathing.
 - D. Flashing and Plastic Cement: ASTM D4586, Type I for horizontal application. ASTM D4586, Type II for vertical application. Products shall be asbestos free.
 - E. Ridge caps to be same style, color and manufacturer as shingles.
 - F. Ridge vents shall be:
 - 1. Continuous, prefinished aluminum, "Shingle Over" type, minimum 18 Sq. In. free area per lineal foot equal to Air Vent "Shingle Vent II" series.
 - a. Color selected by A/E from manufacturer's full line.

44 2.03 FLASHING MATERIALS

- 45
46
47
48
49
50
51
52
53
54
- A. Metal drip edge: Minimum 28 gauge, factory pre-finished, galvanized sheet metal of commercial quality, zinc-coated steel with 0.20 percent copper, ASTM A525, G90 hot-dip galvanized, mill phosphatized, extra smooth, factory primed on both sides, finished on one side with flouropolymer coating masked with strippable plastic film for protection, brake formed to provide 3" roof deck flange (Style "D").
 - B. Metal flashing: 24 gauge kynar coated galvanized sheet metal. Job-cut to sizes and configurations required.

1 C. Flashing for this Section shall be supplied and installed under this Section.

- 2 1. Where required, shapes of flashing shall be custom formed with a sheet metal break per details
3 on the Drawings.
4

5
6 PART 3 - EXECUTION

7
8 3.01 EXAMINATION

9
10 A. Verify that substrate meets requirements for installation tolerances and other conditions affecting
11 performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have
12 been corrected.

- 13 1. Confirm that all roof penetrations are completed and flashed.
14 2. Confirm that all plumbing stacks are through the roof and flashed.
15 3. Confirm that all sheathing is free of ridges, warps, or other defects.
16 4. Confirm that wood blocking, curbs and nailers are securely anchored, and that roof openings and
17 penetrations are in place and set and braced.
18 5. Confirm that the substrate is clean, dry and free from sharp projections and depressions and that
19 all surfaces and site conditions are ready to receive new materials.
20 6. Confirm that all flashing not provided by this Section is installed or ready to be coordinated with
21 this Section.
22

23 3.02 INSTALLATION

24
25 A. Install per manufacturer's instructions.

- 26 1. Pressure Treated Plywood and Lumber: These products shall not be specified or provided for use
27 in roofing projects as a substrate material intended to receive mechanical fasteners used to secure
28 metal roof panels, panel clips, metal coping, roof penetration curbs cap and counterflashing, all
29 other metal flashing, roofing insulation and membrane installations that are a part of the roof
30 system.
31 2. The manufacture shall approve of all mechanical fasteners used to secure all roof system
32 components.
33

34 B. Eave ice dam protection: Install waterproofing underlayment in accordance with the manufacturer's
35 detailed instructions, directly to the substrate as follows:
36

37 C. Install drip edge at all eaves and gables. Lap end joints and seal with plastic roof cement. Nail flanges
38 to roof with nails compatible with flashing metal.

- 39 1. On eave and rake edges, sheet membrane shall overlap the fascia by 2".
40 2. Edge metal shall be sized to conceal the ice protection sheet membrane lapped onto fascia.
41

42 D. Install a continuous strip of waterproofing underlayment at all eaves or the bottoms of all pitched
43 roofs.
44

45 E. Attach waterproofing underlayment to sheathing as per manufacturer's directions. Lap ends.
46

47 F. Waterproofing underlayment shall extend 24" towards interior of building over heated spaces from
48 face of outside wall when measured on a horizontal plane.

- 49 1. One (1) course wide around all penetrations.
50

51 G. Protective underlayment:

- 52 1. Install two (2) plies of shingle underlayment horizontally over the entire roof. Install in shingle
53 fashion, lapping each course 19" over the proceeding course leaving an exposure of 17". Lay
54 smooth without wrinkles.

- 1 2. Nail to roof sheathing with large head roofing nails and lap ends 4" at ends and edges. Stagger
- 2 laps of consecutive courses.
- 3 3. Install felt perpendicular to roof pitch.
- 4 4. Nail felt to sheathing as per manufacturer's instructions.
- 5
- 6 H. Asphalt shingles:
- 7 1. Install all shingles in accordance with manufacturer's instructions.
- 8 2. Replace any and all damaged or wrinkled underlayment, loose or high underlayment fasteners.
- 9 3. Sweep the entire roof to remove loose granules, wood dust/particles, fasteners and other debris.
- 10 4. Install double starter course at all eaves.
- 11 5. Install shingles in the pattern specified by the manufacturer for the specific shingle.
- 12 6. Coordinate installation of shingles with all related trades.
- 13 7. Ensure that vertical layout is such that there is one full shingle exposure below ridge cap.
- 14 8. Install starter course with sealing strip toward eave and fasten with 3/8" overhang over fascia drip
- 15 edge. DO NOT nail through the edge metal flange or where cutouts will occur in the first course
- 16 of shingles.
- 17 9. First course is to project 3/8" beyond drip edge at gables.
- 18 10. Layout shingles in such a way so as to center tabs on width of roof have no less than 1/2 tabs at
- 19 each gable end.
- 20 a. Install shingles across and diagonally up the roof with each course offset in accordance
- 21 with the manufacturer's instructions. The straight-up or racking method of application is
- 22 unacceptable.
- 23 b. Do not install any single shingle less than 12" wide.
- 24
- 25 11. Do not work on asphalt shingle roofs in weather over 90 degrees.
- 26 12. Install ridge vent as per manufacturer's details or as detailed on the Drawings.
- 27 a. Provide equivalent to 1/300 of attic floor area.
- 28 b. Shingle over ridge vents.
- 29
- 30 13. Install ridge caps per manufacturer's instructions.
- 31 14. Work from 5 or 6 bundles of shingles at once to ensure that color variations from bundle to
- 32 bundle are evenly dispersed.
- 33 15. Drive nails straight and flush with shingle. Do not break shingle surface with nail head. Do not
- 34 drive nails into cracks in the roof deck. Repair faulty nailing immediately.
- 35 16. Flash all penetrations as shingling progresses up the slope of the roof. Use appropriate flashings
- 36 interlaced with the shingles and adhered with plastic cement as recommended by the
- 37 manufacturer. Bottoms of flashings shall be exposed.
- 38 17. Periodically during installation and again at completion, review shingle installation from the
- 39 ground to observe possible high nail locations or substrate conditions that prevent proper shingle
- 40 lay down and adherence to the previous shingle coursing. Remove all high nails and correct
- 41 improper substrate condition to allow proper shingle lay down.
- 42
- 43 3.03 ATTIC STOCK
- 44
- 45 A. At the completion of the project, provide the institution three (3) bundles of new shingles.
- 46
- 47 3.04 CLEAN-UP AND REPAIR
- 48
- 49 A. Replace any shingles damaged during installation or construction.
- 50
- 51 B. Remove all roofing cement from exposed surfaces.
- 52
- 53 C. Remove all shingle scraps and other debris from the site at the end of each work day.
- 54

- 1 D. Clean roof and replace damaged shingles Sweep the entire roof surface to remove loose granules and
2 other debris. Clean all gutters to be free of roofing debris including shingle and metal cuttings nails
3 and shingle granules to allow for unobstructed, proper water flow.
4
5
6
7

END OF SECTION 07 31 13

Address _____

Roof Area(s) _____

Manufacturer _____

Type of Roofing System _____ Prime Contractor _____

Shingle Warranty Registration No. _____ Warranty web site _____

Date of Completion _____ Guarantee Starts _____ Guarantee Expires _____

List Additional Manufacturer Warranty and/or Guarantee Submittals Required
(submit all of the additional warranty/ guarantees required at the same time along with this guarantee)

Total System Warranty–Yes No **Membrane Warranty**–Yes No **Metal Guarantee**–Yes No

Subject to the terms, conditions and limitations stated herein, we, the undersigned hereby jointly and severally guarantee that the roofing system installed on the above named building, will remain in a watertight condition, free from leaks and defects in materials or workmanship, for a period of five (5) years from the date of completion; and that we will at our expense, make or cause to be made such permanent repairs to said roofing system having defects in any of the materials and workmanship applied by or through the undersigned, as may be necessary to restore to compliance with the specifications or replace said roofing system in a water tight condition without defects as hereinafter defined.

This guarantee is made subject to the following terms and conditions: The term “defect” shall include leak(s), faulty installation, installation of other than specified materials, and the following,

- **Shingle/Tile/Slate Roofing Systems:** Broken, cracked, split, curled, spalled, blistered, unsealed or otherwise deteriorated shingles, tile or slate units; non-seated, non-secure nails/fasteners backing out or exposed, wrinkled underlayment; installation on loose, buckled or deteriorated sheathing/decking.

The term “roofing system” shall mean all the materials above the structural roof deck associated with the roof system that are furnished under this contract and the workmanship for installing such materials as required per the manufacture’s installation instructions to achieve a watertight system.

ROOFING SYSTEM GUARANTEE

No work will be done on said roof by the City of Madison, including, but without limitation, work in connection with flues, vents, drains, sign braces, antennas, railings, platforms or other equipment fastened to or set on the roof, and no repairs or alterations will be made to said roof, unless the undersigned are first notified and given the opportunity to make the necessary roofing application recommendations with respect thereto, and such recommendations are complied with by the City of Madison. Failure to observe this condition shall render this guarantee null and void.

In the event leak(s) or defects should occur, the User Agency shall notify the undersigned parties in writing at the addresses listed below within thirty (30) days of discovery of leak(s) or defects. If repairs are not initiated within ten (10) days from the date of receipt of written notice that leaks or defects exist, the City of Madison is hereby authorized to have repairs made to the roofing system as is required without invalidating this guarantee, and the undersigned agrees to pay all costs for repair or replacement of leak(s) or defects in roofing system within thirty (30) days from the date such repairs or material replacement have been completed and approved by the City of Madison.

In the event that the City of Madison has notified the Contractor of the need to repair leak(s) through the roofing system and an emergency condition exists which requires immediate repair to avoid substantial damage to the City of Madison, the City of Madison may make such temporary repairs as may be essential and such action shall not be a breach of this Guarantee, so long as the City of Madison complies with other provisions of the Guarantee.

This Guarantee is in lieu of all other warranties expressed or implied, including warranties of merchantability or fitness for any particular purpose. No representatives of the parties herein named have the authority to make any representations other than those stated herein.

Specifically excluded from this guarantee is any and all damages to said roof system, the building or contents therein caused by any one or combination of the following,

- Acts or omissions of the City of Madison.
- Damage resulting from natural disasters; i.e., windstorm (exceeding velocity of 70 miles per hour), hail, flood, hurricane, lightning, or other phenomena of the elements.
- Damage resulting from the building structure failing to have adequate strength to support all live and dead loads, including water and snow loads, or any damage resulting from any other structural defects or failures.
- Damage resulting from objects, misuse or abuse of the roofing system, or traffic, recreational activities, or storage of material on the roofing system.
- Discharge of vegetable, mineral, animal oils, greases, solvents, or chemicals such as industrial wastes, upon the roof surface, unless originally designed for such purpose and prior written approval is received.

IN WITNESS WHEREOF, this instrument has been duly executed,

PRIME CONTRACTOR

ROOFING CONTRACTOR

(If the Roofing Contractor is also the Prime Contractor, only one signature in either signature block is required)

Signature _____

Signature _____

Name/Title _____

Name/Title _____

Date _____

Date _____

Address _____

Address _____

Telephone _____

Telephone _____

Seal

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SECTION 07 42 13

METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Concealed-fastener Metal Wall Panels, solid and perforated.
- B. Related Sections:
1. Division 05 Section "Cold-Formed Metal Framing" for support framing, including girts, studs, and bracing.
 2. Division 07 Section "Air Barriers" "Water-Resistive Barriers" for continuous air barrier systems.
 3. Division 07 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work.

1.03 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Concealed Fastener Panels:
1. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - A. Test-Pressure Difference: 6.24 lbf/sq. ft.
 2. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at a differential of 10 percent of inward acting design load after 15 minutes:
 - A. Test-Pressure Difference: 15.00 psf minimum
 3. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
 - A. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - 1) Uniform pressure of 65 lbf/sq. ft., acting inward or outward.

- 1
2 B. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with
3 horizontal deflections no greater than 1/180 of the span.
4
5 D. Thermal Movements: Allow for thermal movements from ambient and surface temperature
6 changes by preventing buckling, opening of joints, overstressing of components, failure of joint
7 sealants, failure of connections, and other detrimental effects. Base calculations on surface
8 temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
9 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
10
11 1.05 SUBMITTALS
12
13 A. Submit in accord with the general requirements of this contract.
14
15 B. Product Data: For each type of product indicated. Include construction details, material
16 descriptions, dimensions of individual components and profiles, and finishes for each type of
17 metal-faced composite wall panel and accessory.
18
19 C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge
20 conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings,
21 closures, and accessories; and special details. Distinguish among factory-, shop-, and field-
22 assembled work.
23 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2
24 inches per 12 inches:
25 A. Flashing and trim.
26 B. Anchorage systems.
27
28 D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color
29 finishes.
30 1. Include similar Samples of trim and accessories involving color selection.
31 2. Include manufacturer's color charts consisting of strips of cured sealants showing the
32 full range of colors available for each sealant exposed to view.
33
34 E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size
35 indicated below:
36 1. Metal Panels: Minimum 10 x 10 inches.
37 2. Trim and Closures: 10 inches long. Include fasteners and other exposed accessories.
38 3. Accessories: 10-inch- long Samples for each type of accessory.
39 4. Exposed Sealants: For each type and color of joint sealant required. Install joint
40 sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material
41 matching the appearance of metal-faced composite wall panels adjacent to joint
42 sealants.
43
44 F. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with
45 performance requirements and design criteria, including analysis data signed and sealed by the
46 qualified professional engineer responsible for their preparation.
47
48 G. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are
49 shown and coordinated with each other, using input from installers of the items involved:
50 1. Wall panels and attachments.
51 2. Girts or sub-framing.
52 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
53 4. Penetrations of wall by pipes and utilities.
54
55 H. Qualification Data: For Installer and professional engineer.

- 1
2 I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
3 testing agency, for each product.
4
5 J. Maintenance Data: For metal wall panels to include in maintenance manuals.
6
7 K. Warranties: Samples of special warranties.
8
9 1.06 QUALITY ASSURANCE
10
11 A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
12
13 B. Source Limitations: Obtain each type of metal-faced composite wall panel from single source
14 from single manufacturer.
15
16 C. Fire-Resistance Ratings: Where indicated, provide metal-faced composite wall panels identical
17 to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency.
18 Identify products with appropriate markings of applicable testing agency.
19 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings
20 of another qualified testing agency.
21
22 D. Preinstallation Conference: Conduct conference at Project site.
23 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting
24 agency representative, metal wall panel Installer, metal wall panel manufacturer's
25 representative, structural-support Installer, and installers whose work interfaces with or
26 affects metal wall panels, including installers of doors, windows, and louvers.
27 2. Review and finalize construction schedule and verify availability of materials,
28 Installer's personnel, equipment, and facilities needed to make progress and avoid
29 delays.
30 3. Review methods and procedures related to metal wall panel installation, including
31 manufacturer's written instructions.
32 4. Examine support conditions for compliance with requirements, including alignment
33 between and attachment to structural members.
34 5. Review flashings, special siding details, wall penetrations, openings, and condition of
35 other construction that will affect metal wall panels.
36 6. Review governing regulations and requirements for insurance, certificates, and tests
37 and inspections if applicable.
38 7. Review temporary protection requirements for metal wall panel assembly during and
39 after installation.
40 8. Review wall panel observation and repair procedures after metal wall panel
41 installation.
42
43 1.07 DELIVERY, STORAGE, AND HANDLING
44
45 A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be
46 damaged or deformed. Package metal-faced composite wall panels for protection during
47 transportation and handling.
48
49 B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending,
50 warping, twisting, and surface damage.
51
52 C. Store metal wall panels horizontally vertically on platforms or pallets, covered with suitable
53 weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive
54 slope for drainage of water. Do not store metal wall panels in contact with other materials that

1 might cause staining, denting, or other surface damage. Do not allow storage space to exceed
2 120 deg F.

- 3
4 D. Retain strippable protective covering on metal-faced composite wall panel for period of panel
5 installation.

6
7 1.08 PROJECT CONDITIONS

- 8
9 A. Weather Limitations: Proceed with installation only when existing and forecasted weather
10 conditions permit assembly of metal wall panels to be performed according to manufacturer's
11 written instructions and warranty requirements.

- 12
13 B. Field Measurements: Verify locations of structural members and wall opening dimensions by
14 field measurements before metal wall panel fabrication and indicate measurements on Shop
15 Drawings.

16
17 1.09 COORDINATION

- 18
19 A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction
20 of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive
21 installation.

22
23 1.010 WARRANTY

- 24
25 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
26 replace components of metal wall panel assemblies that fail in materials or workmanship within
27 specified warranty period.

- 28 1. Failures include, but are not limited to, the following:

- 29 A. Structural failures, including rupturing, cracking, or puncturing.
30 B. Deterioration of metals and other materials beyond normal weathering.

- 31
32 2. Warranty Period: Two years from date of Substantial Completion.

- 33
34 B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer
35 agrees to repair finish or replace metal wall panels that show evidence of deterioration of
36 factory-applied finishes within specified warranty period.

- 37 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- 38 A. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
39 B. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
40 C. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

- 41
42 2. Finish Warranty Period: 20 years from date of Substantial Completion.

43
44 PART 2 - PRODUCTS

45
46 2.01 PANEL MATERIALS

- 47
48 A. Aluminum Metal Plate

- 49 1. Aluminum Material: Tension-leveled,
50 2. 70% Fluoropolymer PVDF painted finish, 3003-H14 manganese alloy.
51 3. Thickness: 0.080 inch.
52 4. Weight: Less than 2 lbs per sf.

- 53 B. Panel Depth: 1 ¼" minimal.

- 54 C. Panel Size: As indicated on drawings.

- 55 D. Panel Joints: As indicated on drawings.

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2.02 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.
- C. Zee Clips: 0.079-inch nominal thickness.
- D. Base or Sill Angles and Channels: 0.079-inch nominal thickness.
- E. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements.
 - 2. Depth: As indicated or required for a complete installation.
- F. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.
 - 1. Nominal Thickness: As required to meet performance requirements, or as indicated.
 - 2. Depth:
 - A. As indicated or required for a complete installation.
 - B. Custom sizes are required.
 - 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
 - 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch- diameter wire.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.
 - 1. Nominal Thickness: As required to meet performance requirements.
- H. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous metal framing members to substrates.

2.03 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.04 ALUMINUM METAL PLATE WALL PANELS, CONCEALED FASTENER RAINSCREEN SYSTEM, REVEAL JOINT, MP-1

- A. Basis-of-Design Product: Provide Aluminum Wall Panel System of dry joint design by Dri-Design, Holland, MI;
 - 1) Or approved equal by Alcan Composites USA Inc., Alucobond; Alcoa Inc.; Reynobond PE or ALPOLIC, Division of Mitsubishi Chemical America, Inc.

1 B. Reveal-Joint, Concealed-Fastener Metal Wall Panel Rainscreen System: With
2 narrow reveal joint between panels.

- 3 1) Joint: Dry, narrow reveal joint between panels.
4 2) Color: Color as selected by Architect.
5

6 C. Performance Requirements

- 7 1) Metal Plate Wall Panel Assemblies: Comply with performance
8 requirements without failure due to defective manufacturing, fabrication,
9 installation, or other construction defects.
10 2) Design, fabricate, and erect a dry joint, pressure equalized rainscreen
11 aluminum wall panel system without use of sealants, gaskets, or butyl tape,
12 tested as installed in compliance with AAMA 508, and as follows.
13 a) Pressure Equalization Cycling: Pass cycled pressure loading from 5
14 psf to 25 psf for 100 three-second cycles at 0.08 seconds or less;
15 ASTM E 1233.
16 b) Air Infiltration: 0.12 cfm per sf of wall area, tested at 1.57 psf (25
17 mph) in accordance with ASTM E 283.
18 i. Maintain air/water barrier leakage rate at 0.11 to 0.13 cfm per sf at
19 1.57 psf when tested in accordance with ASTM E 283 in
20 compliance with AAMA 508 criteria.
21 c) Water Penetration:
22 i. Static: Pass water penetration test under static pressure when
23 tested in accordance with ASTM E 331 at a differential of 10
24 percent of inward acting design load, with 15 psf pressure
25 differences for at least 15 minutes with 5 gal per sf per hour of
26 water applied.
27 ii. Dynamic: Pass water penetration test under dynamic pressure of
28 6.24 psf in accordance with AAMA 501.1.
29 d) Structural: Provide systems tested in accordance with ASTM E 330
30 and certified to be without permanent deformation or failure of
31 structural members.
32
33
34

35 D. Fabrication

- 36 1) Fabricate and finish wall panels within manufacturer's facilities and fulfill
37 indicated performance requirements demonstrated by laboratory testing.
38 a) Comply with indicated profiles and with dimensional and structural
39 requirements.
40 2) Provide aluminum wall panels with welded inside corners at backside,
41 typically at corner locations where metal plate is bent to form reveals.
42 3) Provide post-finishing of panels, paint aluminum wall panels only after
43 completion of panel fabrication.
44

45 2.05 PERFORATED ALUMINUM METAL PLATE WALL PANELS, CONCEALED FASTENER
46 RAINSCREEN SYSTEM, REVEAL JOINT: MP-2

47 A. Perforated panels with insect screen within the MP-1 system. All components of perforated
48 panels to match MP-1 for a complete installation including finish, material, fastening, panel
49 profile, panel joints, etc.

- 50 1. Pattern and size of perforation to be selected by architect from manufacturer's full
51 range.
52

53 B. Wire Mesh Insect Screen.

- 54 1. Stainless steel.
55

- 1 2.06 ACCESSORIES
2
3 A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly
4 including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets,
5 fillers, closure strips, and similar items. Match material and finish of metal wall panels unless
6 otherwise indicated.
7 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall
8 panels.
9 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from
10 material recommended by manufacturer.
11 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam
12 or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips;
13 cut or premolded to match metal wall panel profile. Provide closure strips where
14 indicated or necessary to ensure weathertight construction.
15
16 B. Provide integral drainage system and manufactures standard extrusions at termination of
17 dissimilar materials.
18
19 C. Flashing and Trim: Match material, finish, and color of adjacent wall panels. Refer to Section
20 07 62 00.
21
22 D. Substrate Wall Sheathing: Refer to section 06 10 00.
23
24 E. Weather Barriers: Refer to section 07 28 00.
25
26 F. Panel Sealants:
27 1. As recommended by metal panel manufacturer for openings within wall panels and
28 perimeter conditions. Refer to 07 92 00 for requirements.
29
30 G. Sub-girts and/or Z-furring:
31 1. Galvanized steel, minimum 20 gage, dimensions as indicated on drawings. Furring Chan-
32 nel: Provide Hat, C, U or Z type as recommended by manufacturer.
33 2. Flat Strap: At least 14 gage thick
34
35 H. Panel Fasteners: Stainless steel fasteners suitable for attaching to specified substrate. Minimum
36 3/4 inch length, with heads/integral washers a minimum of 7/16 inch diameter.
37
38 I. Pre-finished Moldings: Manufacturer's standard line of extrusions; finish to match panel, to
39 profile required on Drawings.
40
41 2.07 FINISHES
42
43 A. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products, for
44 recommendations of designating finishes.
45
46 B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured
47 polyvinylidene fluoride (PVDF) resin system.
48 1. Three-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less
49 than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare,
50 pre-treat, and apply coating to exposed metal surfaces to comply with coating and
51 resin manufacturers' installation instructions.
52 2. Color as selected by Architect.
53
54 C. Field Touch-Up Materials: As recommended by coating manufacturer for field application.
55

1 2.08 FABRICATION

- 2
- 3 A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent
4 possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated
5 performance requirements demonstrated by laboratory testing. Comply with indicated profiles
6 and with dimensional and structural requirements.
- 7
- 8 B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel
9 and with joints between panels designed to form weathertight seals.
- 10
- 11 C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length
12 of panel.
- 13
- 14 D. As applicable, fabricate metal wall panel joints with factory-installed captive gaskets or
15 separator strips that provide a tight seal and prevent metal-to-metal contact, and that will
16 minimize noise from movements within panel assembly.
- 17
- 18 E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in
19 SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and
20 other characteristics of item indicated.
- 21
- 22 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling,
23 and tool marks and that are true to line and levels indicated, with exposed edges folded
24 back to form hems.
- 25 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams
26 and seal with epoxy seam sealer. Rivet joints for additional strength.
- 27 3. Seams for Other Than Aluminum: Fabricate non-moving seams in accessories with
28 flat-lock seams. Tin edges to be seamed, form seams, and solder.
- 29 4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate
30 elastomeric sealant to comply with SMACNA standards.
- 31 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not
32 allowed on faces of accessories exposed to view.
- 33 6. Fabricate cleats and attachment devices from same material as accessory being
34 anchored or from compatible, noncorrosive metal recommended by meta wall panel
35 manufacturer.
- 36 A. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or
37 metal-faced composite wall panel manufacturer for application, but not less than
38 thickness of metal being secured.
- 39

40 2.09 GENERAL FINISH REQUIREMENTS

- 41
- 42 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
43 recommendations for applying and designating finishes.
- 44
- 45 B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a
46 strippable, temporary protective covering before shipping.
- 47
- 48 C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.
49 Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half
50 of the range of approved Samples. Variations in appearance of other components are acceptable
51 if they are within the range of approved Samples and are assembled or installed to minimize
52 contrast.
- 53

54 PART 3 - EXECUTION

- 1 3.01 EXAMINATION
2
3 A. Examine substrates, areas, and conditions, with Installer present, for compliance with
4 requirements for installation tolerances, metal-faced composite wall panel supports, and other
5 conditions affecting performance of the Work.
6 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural
7 panel support members and anchorage have been installed within alignment tolerances
8 required by metal-faced composite wall panel manufacturer.
9 2. Examine wall sheathing to verify that sheathing joints are supported by framing or
10 blocking and that installation is within flatness tolerances required by metal-faced
11 composite wall panel manufacturer.
12 3. Verify that weather-resistant sheathing paper has been installed over sheathing or
13 backing substrate to prevent air infiltration or water penetration.
14 4. For the record, prepare written report, endorsed by Installer, listing conditions
15 detrimental to performance of work.
16
17 B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual
18 locations of penetrations relative to seam locations of panels before panel installation.
19
20 C. Proceed with installation only after unsatisfactory conditions have been corrected.
21
22 3.02 PREPARATION
23
24 A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall
25 panel support members and anchorage according to ASTM C 754 and metal-faced composite
26 wall panel manufacturer's written instructions.
27
28 3.03 THERMAL INSULATION INSTALLATION
29
30 A. Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with
31 installation requirements in Division 07 Section "Thermal Insulation."
32 1. Erect insulation horizontally and hold in place with Z-shaped furring members spaced
33 24 inches o.c. Attach furring members to substrate with screws spaced 24 inches o.c.
34
35 B. Blanket Insulation: Install insulation concurrently with metal wall panel installation, in thickness
36 indicated to cover entire wall, according to manufacturer's written instructions and as follows:
37 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation
38 to surrounding construction to ensure airtight installation.
39 2. Install insulation straight and true in one-piece lengths. Comply with the following
40 installation method:
41 A. Over-Framing Installation: Extend insulation over and perpendicular to top flange
42 of framing members.
43
44 3.04 METAL WALL PANEL INSTALLATION
45
46 A. General: Install metal wall panels according to manufacturer's written instructions in
47 orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and
48 subgirts unless otherwise indicated. Anchor panels and other components of the Work securely
49 in place, with provisions for thermal and structural movement.
50 1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence
51 of factory-authorized representative.
52 2. Shim or otherwise plumb substrates receiving metal wall panels.
53 3. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not
54 begin installation until weather barrier and flashings that will be concealed by panels
55 are installed.

- 1 4. Install screw fasteners in predrilled holes.
- 2 5. Locate and space fastenings in uniform vertical and horizontal alignment.
- 3 6. Install flashing and trim as metal wall panel work proceeds.
- 4 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices
- 5 and end laps to avoid a four-panel lap splice condition.
- 6 8. Apply elastomeric sealant continuously between metal base channel (sill angle) and
- 7 concrete, and elsewhere as indicated or, if not indicated, as necessary for
- 8 waterproofing.
- 9 9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping
- 10 screws. Fasten flashings and trim around openings and similar elements with self-
- 11 tapping screws.
- 12 10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- 13

14 B. Fasteners:

- 15 1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces
- 16 exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces
- 17 exposed to the interior.
- 18

19 C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates,

20 protect against galvanic action as recommended by metal-faced composite wall panel

21 manufacturer.

22

23 D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for

24 weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and

25 sealants indicated or, if not indicated, types recommended by panel manufacturer.

26

- 27 1. Seal metal wall panel end laps with double beads of tape or sealant, full width of
- 28 panel. Seal side joints where recommended by metal wall panel manufacturer.
- 29 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section
- 30 "Joint Sealants."
- 31

32 E. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff

33 from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

34

35 3.05 ACCESSORY INSTALLATION

36

37 A. General: Install accessories with positive anchorage to building and weathertight mounting and

38 provide for thermal expansion. Coordinate installation with flashings and other components.

- 39 1. Install components required for a complete metal wall panel assembly including trim,
- 40 copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and
- 41 similar items.
- 42

43 B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation

44 instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners

45 where possible, and set units true to line and level as indicated. Install work with laps, joints,

46 and seams that will be permanently watertight and weather resistant.

- 47 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and
- 48 tool marks and that is true to line and levels indicated, with exposed edges folded back
- 49 to form hems. Install sheet metal flashing and trim to fit substrates and to result in
- 50 waterproof and weather-resistant performance.
- 51 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
- 52 Space movement joints at a maximum of 10 feet with no joints allowed within 24
- 53 inches of corner or intersection. Where lapped expansion provisions cannot be used or
- 54 would not be sufficiently weather resistant and waterproof, form expansion joints of

- 1 intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant
2 (concealed within joints).
3
- 4 3.06 FIELD QUALITY CONTROL
5
- 6 A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to
7 perform field tests and inspections and prepare test reports.
8
- 9 B. Water-Spray Test: After completing the installation of 75-foot- by-2-story minimum area of
10 metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a
11 2-bay area directed by Architect.
12
- 13 C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and
14 test completed metal wall panel installation, including accessories.
15
- 16 D. Remove and replace metal wall panels where tests and inspections indicate that they do not
17 comply with specified requirements. Additional tests and inspections, at Contractor's expense,
18 will be performed to determine compliance of replaced or additional work with specified
19 requirements.
20
- 21 3.07 CLEANING AND PROTECTION
22
- 23 A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite
24 wall panels are installed unless otherwise indicated in manufacturer's written installation
25 instructions. On completion of metal-faced composite wall panel installation, clean finished
26 surfaces as recommended by panel manufacturer. Maintain in a clean condition during
27 construction.
28
- 29 B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt,
30 and sealant.
31
- 32 C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair
33 by finish touchup or similar minor repair procedures.
34
35
36
- END OF SECTION 07 42 13

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SECTION 07 44 56

MINERAL-FIBER-REINFORCED CEMENTITIOUS PANELS

PART 1:GENERAL

1.01RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02WORK INCLUDED

- B. Through color high density fiber cement panels
C. Cladding attachment system.

1.03RELATED WORK

- A. Cold Formed Metal Framing: Section 05 40 00.
B. Rough Carpentry: Section 06 10 00.
C. Water-Resistive Barrier: Section 07 28 00.

1.04REFERENCES

- A. ASTM International (ASTM):
1. ASTM C 1185 - 08 Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
2. ASTM C 1186 - 08 Standard Specification for Flat Fiber-Cement Sheets.
3. ASTM E 84 - Surface Burning Characteristics of Building Materials.
4. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degree C.

1.05SUBMITTALS

- A. Submit the following:
1. Manufacturer's product data including preparation instructions, storage and handling requirements, installation methods.
2. Shop Drawings: provide detailed drawings of non-standard applications of fiber cement materials. Submit engineering attachment drawings, installation drawings and details.
3. Samples: Minimum 6" samples of each product.
4. Submit installer qualifications with a minimum of 2 years of experience with installation of similar products.
5. Provide a mock up including typical installation conditions at jambs, heads, sills and a pre-installation conference for acceptance of work prior to proceeding.

1.06DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommended guidelines.

- 1 B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits
2 recommended by manufacturer for optimum results. Do not install products under environmental
3 conditions outside manufacturer's recommended limits.
4

5 1.07 WARRANTY
6

- 7 A. Manufacturer's limited product warranty against manufacturing defects in materials and workmanship.
8

9 PART 2:PRODUCTS
10

11 2.01 MANUFACTURERS
12

- 13 A. Basis of Design: AFC Cladding Fiber Cement Panels by American Fiber Cement Corp.; 6901 S.
14 Pierce St. Suite 260, Littleton, CO 80128. ASD. Toll Free Tel: (800) 688-8677 ext. 102. Tel: (303)
15 978-1199. Fax: (303) 978-0308. Email: danglada@afcccladding.com. Web:
16 <http://www.americanfibercement.com>.
17
18 B. Or Swisspearl panels that conform with specifications.
19
20 C. Cement Board Fabricators (CBF) Silbonit. (800) 366-5378.
21
22 D. Or approved equal.
23

24 2.02 THROUGH COLOR HIGH DENSITY FIBER CEMENT PANELS
25

- 26 A. Cembonit (Cembrit Patina Board) as manufactured by American Fiber Cement Corp.
27 1. Application: Exterior
28 2. Thickness: 5/16"
29 3. Finish: Through-colored, muted, matte finish with a unique weather-proof treatment which
30 makes it resistant to staining and surface dirt.
31 4. Colors to be selected from manufacturer's full range. See drawings for colors FCP-1, FCP-2
32 and FCP-3.
33 5. Physical Characteristics: EN 12467 'Fiber-cement flat sheets'.
34 a. Density Dry: 1500 kg/m³.
35 b. Bending strength at with grain: 32.0 MPa.
36 c. Bending strength at across grain: 22.0 MPa.
37 d. Modulus of elasticity at with grain: greater than 16 GPa.
38 e. Modulus of elasticity at across grain: greater than 14 GPa.
39 f. Hygric movement wet-dry-wet (max), mean: 2.60 mm/m.
40 g. Durability classification (EN 12467): Category A.
41 h. Strength classification (EN 12467): Class 4.
42 i. Fire reaction (EN 13501-1): A2-s1-d0.
43 j. Warm water test: Ok.
44 k. Soak dry test: Ok.
45 l. Freeze thaw test: greater than 100 cyc
46 m. Thermal conductivity e: 0.4 W/mK
47

48 2.03 MISCELLANEOUS CLADDING MATERIALS
49

- 50 A. Refer to section 07 28 00 for Building Wrap, Building Wrap Tape or Henry Roll on over substrate
51 at exposed joints if water resistive barrier is not black.
52

53 2.04 ATTACHMENT SYSTEMS AND FIXING
54

- 1 A. Attachment system for ventilated rain screen construction of exterior cladding panels.
2 2. Product: R-TEC CI System as manufactured/supplied by American Fiber Cement Corp. for
3 compliance with ASHRAE 90.1-2013 continuous insulation definitions and requirements.
4 a. Material: Aluminum.
5
6 3. Accessories:
7 a. R-TEC CI Bracket
8 b. Aluminum "L," "T," "Hat" or "Z" profiles as indicated on engineered design submittal.
9 c. Fixing: As selected and engineered by attachment manufacturer to conform with the
10 specified cladding and the exterior insulation in both thickness and type. i.e. Foam (high
11 or low density) or mineral wool.
12
13 4. UV Protective membrane: Refer to section 07 28 00. UV protective membrane shall be
14 installed at all exposed joints.
15 a. For open joint ventilated rain screen systems.
16 b. For exterior insulation requiring UV protection.
17
18 5. EPDM rubber strips by manufacturer to be installed continuous through horizontal joints to
19 conceal framing members.
20
21 6. Fixing Accessories:
22 a. Color-matched stainless steel Astro rivets.
23

24 PART 3:EXECUTION

25 3.01EXAMINATION

- 26
27
28 D. Examine substrate to verify acceptable conditions prior to installing.
29
30 E. Notify architect of unsatisfactory preparation before proceeding.
31

32 3.02INSTALLATION

- 33
34 A. Clean surfaces prior to installation.
35
36 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best
37 result for the substrate under the project conditions.
38
39 C. Install in accordance with manufacturer's instructions and approved submittals.
40
41 D. For exterior applications, comply with local codes and structural engineer's fastening calculations
42 along with manufacturer's recommendations for fastener spacing.
43
44 E. Air space at top and bottom of building or wall termination shall be 3/4 inch (20 mm) to facilitate
45 airflow from behind the panels. Do not block vertical airflow at windows, doors, eaves, or at the
46 base of the building. Airflow shall be continuous from bottom to top so there is air movement
47 behind each panel. All joint dimensions to comply with Manufacturer's requirements.
48
49 F. Fasteners in profile shall accommodate thermal expansion/contraction of metal and not interfere
50 with panel application.
51
52 G. Install panels from top of building to bottom.
53
54 H. For straight walls, start panel installation in center and work outward.

- 1
- 2 I. For walls with inside corners, start installation at corner and work across wall.
- 3
- 4 J. Pattern: Pattern and panel size as indicated on elevations.
- 5
- 6 K. Rain Screen Installation: Comply with manufacturer's installation requirements.
- 7 a. Attachment System: Comply with manufacturer's engineered design for cladding support
- 8 framing.
- 9

10 3.03CLEANING

- 11
- 12 A. Protect installed products and replace damaged products.
- 13
- 14
- 15

END OF SECTION 07 44 56

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Metal Flashing.
B. Exposed Metal Trim/Fascia/Copings.
C. Miscellaneous Sheet Metal Accessories.

1.03 RELATED WORK

- A. Section 06 10 00, Rough Carpentry for Wood Blocking, Nailers.
B. Section 07 92 00, Joint Sealants:
C. Division 22: Plumbing
D. Division 23: HVAC

1.04 PERFORMANCE REQUIREMENTS

- A. General: Manufacture and install copings, fascia, and scuppers to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
B. FMG Listing: Manufacture and install copings, fascia, and scuppers that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-60. Identify materials with FMG markings.
C. Thermal Movements: Provide manufactured copings, fascia, and scuppers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 REFERENCES

- A. Referenced Standards Recommended practices and details as set forth by the 1993 Edition of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) in the "Architectural Sheet Metal Manual" are incorporated by reference made a part of this work.

1. AISI – American Iron and Steel Institute.
2. ASTM 240 Type 304 Stainless Steel
3. ASTM A653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM B32 - Solder Metal.
5. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
6. ASTM C920 – Elastomeric Joint Sealants.
7. ASTM D2244 – Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D4214 – Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
9. NRCA - Roofing and Waterproofing Manual.
10. SMACNA - Architectural Sheet Metal Manual.

1.06 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Shop Drawings showing profiles, joint treatment, fastening methods, gauge and finish of materials.
 2. Actual samples of pre-finished sheet metal showing the exact color(s) and texture(s) available for selection from manufacturer’s full range.

1.07 GUARANTEE

- A. Manufacturer’s Warranty: Provide the sheet metal manufacturer’s standard twenty (20) year warranty stating at a minimum that the metal finish will not chalk in excess of an eight (8) rating, or fade in excess of a five (5) rating, when tested in accordance with ASTM D2244 and ASTM D4214.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as inside the weatherproofing system and applied on site) must not exceed the following requirements.
1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on October 19, 2000.
- B. Recycled Content of Aluminum Materials: Provide aluminum materials containing the maximum possible amount of postconsumer and preconsumer recycled aluminum content.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to requirements, provide products of one of the following:
1. Cheney Flashing Company.
 2. Hickman, W. P. Company.
 3. Metal-Era, Inc.
 4. MM Systems Corporation.
 5. Perimeter Systems, a division of Southern Aluminum Finishing Co.
 6. Petersen Aluminum Corp.

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2.02 METAL FLASHING

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
- B. Minimum 22 gauge stainless steel or as indicated on drawings.

2.03 EXPOSED METAL TRIM, FASCIA, COPINGS, SCUPPERS, ALUMINUM WINDOW FLASHING, FLASHING ON METAL WALL PANEL SYSTEM

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
 - 1. Aluminum: Coping, fascia and trim: 0.063 inch thick; Scupper: 0.063 inch thick.
 - 2. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
 - a. Acceptable Manufacturer: Econosnap, or approved equal.
 - b. Corners: Mechanically clinched and sealed watertight.
 - c. Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.
 - d. Coping dimensions as indicated in drawings.
 - 3. Surface: Smooth, flat finish. Match the material, finish and color of adjacent metal wall panels.

2.04 ACCESSORIES

- A. Fasteners: Where not specified, size fasteners to suit conditions. No dissimilar metals allowed.
- B. Blind rivets: 1/8" copper "pop" rivets.
- C. Solder: As specified by manufacturer.
- D. Flux: As specified by manufacturer.
- E. Self-Adhering, High-Temperature Sheet Flashing: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- F. Flexible Flashing: 0.045" EPDM.

1 G. Other products, not specifically described, but required for a complete and proper installation of the
2 work in this section shall be selected by the Contractor subject to the approval of the A/E.

3
4 2.05 SEALANT:

5
6 A. Meets ASTM C-920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O.

7
8 B. Federal Specification TT-S-00227E;

9
10 C. CRD C 506, Type II, Multi-part polyurethane base, elastomeric joint sealing compound;
11 1. Color: Selected by A/E from manufacturer's full range of colors.

12
13
14 PART 3 - EXECUTION

15
16 3.01 EXAMINATION

17
18 A. Examine surfaces to be covered by sheet metal. Report any improper defective surfaces to
19 Contractor in writing. Beginning of sheet metal work over surfaces: Presumed as acceptance of
20 surfaces as satisfactory by sheet metal sub-contractor.

21
22 3.02 FABRICATION

23
24 A. Fabricate sections as detailed. Form sections true to shape, accurate in size, square and free from
25 distortion or defects. Do not "punch" metal at brake points.

26
27 B. Form all pieces in lengths of 8'-0" or 10'-0" where practical. Sections less than 3' long are
28 unacceptable unless that section comprises the entire run.

29
30 C. Unless detailed otherwise, hem exposed edges on underside 1/2"; fabricate vertical faces with
31 bottom edge formed outward 3/4" at 30 degrees and hemmed to form drip.

32
33 D. Miter and seam inside and outside corners using rivets and multi-part polyurethane sealant.
34 Outside corners shall be prefabricated with outside face of section broken at corner; seam at
35 corner is unacceptable. Pieces shall be a minimum of 18" in length, in both directions from the
36 corner.

37
38 E. Utilize a minimum 4" back dam and 1 1/2" end dams.

39
40 F. Metal Flashing:

41 1. Formed in 8-foot minimum sections, lap end joints 3 inches.

42
43 3.03 INSTALLATION

44
45 A. General: Install copings, fascia, and scuppers according to manufacturer's written instructions.
46 Anchor copings and scuppers securely in place and capable of resisting forces specified in
47 performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as
48 required to complete manufactured roof specialty systems.

49 1. Install with provisions for thermal and structural movement.

50 2. Torch cutting is not permitted.

- 1 B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect
2 against galvanic action by painting contact surfaces with bituminous coating or by other permanent
3 separation as recommended by manufacturer.
- 4 1. Underlayment: Where installing exposed-to-view components of manufactured roof
5 specialties directly on cementitious or wood substrates, install a course of polyethylene
6 underlayment.
- 7
- 8 C. Installation to have seams and lines as established by the approved shop erection drawings.
- 9
- 10 D. Coping/Scuppers: Install cleats, anchor plates, and other anchoring and attachment accessories and
11 devices with concealed fasteners.
- 12
- 13 E. Minimize all exposed fasteners, utilize cleated seams whenever possible.
- 14
- 15 F. Anchor to resist uplift and outward forces according to performance requirements.
- 16
- 17 G. Install level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-
18 canning, buckling, or tool marks.
- 19
- 20 H. Install to fit substrates and to result in watertight performance. Verify shapes and dimensions of
21 surfaces to be covered before manufacture.
- 22
- 23 I. Expansion Provisions: Provide for thermal expansion of exposed copings and scuppers. Space
24 movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or
25 intersections.
- 26
- 27 J. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will
28 penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- 29
- 30 K. Details should be per SMACNA ARCHITECTURAL SHEET METAL MANUAL recommended
31 details.
- 32
- 33 L. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper,
34 set to correct elevation, and seal flanges to interior and exterior wall faces, over cants or tapered
35 edge strips, and under roofing membrane.
- 36
- 37 3.04 WORKMANSHIP
- 38
- 39 A. Make all work weather and watertight throughout; provide allowances for material expansion and
40 contraction.
- 41
- 42 B. Sections shall be uniform, accurately fitted so as to line up straight and true and rigidly secured in
43 place, without kinks or buckles. Joints at corners and angles shall be smooth, tight and neatly
44 mitered and seamed.
- 45
- 46 C. Unless detailed otherwise, lap all vertical joints between adjacent sections a minimum of 2".
- 47
- 48 D. Where metal is hooked to a continuous cleat, crimp metal to cleat along entire length.
- 49
- 50 E. Repair or replace all damaged or defective work.
- 51
- 52 F. Soldering:
- 53

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1. Rivet pieces prior to soldering.
2. Soldering shall be done with heavy soldering coppers of blunt design, properly tinned before using. Coppers shall weigh not less than 10 pounds per pair. Use of a gas torch is not allowed.
3. Follow manufacturer's recommendations for cleaning, tinning and soldering metal.
4. Soldering shall be done slowly to heat sheet metal thoroughly and to sweat solder completely through full width of seam. Whenever possible, soldering shall be done in flat position; seams on slopes shall be soldered a second time.
5. Clean all flux from metal after soldering is completed.

3.05 COUNTERFLASHING RECEIVER:

- A. Install new receiver as detailed or where required.
- B. Notch and lap joints 3" between sections.
- C. Apply sealant at the joint between the receiver and the masonry wall where receiver is not part of a thru-wall flashing; DO NOT APPLY SEALANT between masonry and thru-wall flashings.

3.06 COUNTERFLASHING:

- A. Fasten counterflashing to receiver with stainless steel sheet metal screws 24" O.C.
- B. Notch and lap joints 3" between sections; bayonet joints are unacceptable. Do not fasten joints between sections.
- C. Counterflashing shall be creased longitudinally just enough to provide a spring action that will hold bottom edge firmly against flashing.

3.07 MISCELLANEOUS FLASHINGS:

- A. Install appropriate flashings at all exhausts, vents and penetrations not specifically called out but required.
- B. Remount and secure all rooftop equipment. Use threaded fasteners.

3.08 CLEANING

- A. Clean exposed sheet metal of roofing materials, mortar, hand marks, other foreign materials.
- B. Remove temporary protective coverings and strippable films as copings and scuppers are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- C. Replace items that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate on side of the barrier.
4. Joints between fire resistance rated assemblies.
5. Perimeter gaps between rated floors/roofs and an exterior wall assembly.

C. Related Sections include, but are not limited to, the following:

1. Division 5 – Expansion, Control, and Seismic Joints
2. Division 8 – Glass, Glazing and Aluminum Storefront Systems
3. Division 9 – Gypsum Wallboard
4. Division 22 and 23 – Mechanical; Pipe and Duct
5. Division 26 – Electrical; Lighting, Power, Alarms, and Communications

1.03 REFERENCES

A. American Society For Testing and Materials Standards (ASTM):

1. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
3. ASTM E 1966: Test Method for Resistance of Building Joint Systems.
4. ASTM E 1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
5. ASTM E 119: Methods of Fire Tests of Building Construction and Materials.
6. ASTM E 2307: Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus
7. ASTM E 2174: Standard Practice for On-Site Inspection of Installed Fire Stops
8. ASTM E 2393: Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

B. Underwriters Laboratories Inc. (UL):

1. UL 723: Surface Burning Characteristics of Building Materials.
2. UL 1479: Fire Tests of Through-Penetration Fire Stops.

1 3. UL 2079: Tests for Fire Resistance of Building Joint Systems.
2

3 C. UL Fire Resistance Directory -Volume 2:

- 4 1. Through-Penetration Firestop Devices (XHJI)
5 2. Fire Resistive Ratings (BXUV)
6 3. Through-Penetration Firestop Systems (XHEZ)
7 4. Fill, Void, or Cavity Material (XHHW)
8

9 D. Omega Point Laboratories (OPL)

- 10 1. Directory of Listed Building Products, Materials & Assemblies – Volume II
11

12 1.04 DEFINITIONS
13

14 A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or
15 floor) where it has been breached, so as to restore the integrity of the fire rating of that wall or floor.
16

17 B. System: The use of a specific firestop material or combination of materials around a specific
18 penetrant(s) or into a specific joint in conjunction with a specific wall and/or floor construction type.
19

20 C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
21

22 D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the
23 barrier.
24

25 E. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the
26 barrier.
27

28 F. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire-rated
29 barriers including where the top of a wall meets a floor; wall edge to wall edge configurations; floor
30 edge to floor edge configurations; floor edge to wall configurations.
31

32 G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire-rated floor
33 assembly and a non-rated exterior wall assembly.
34

35 H. Engineering Judgment: A firestopping assembly proposed for conditions where a tested and listed
36 firestopping system does not exist.
37

38 1.05 PERFORMANCE REQUIREMENTS
39

40 A. Penetrations: Provide through-penetration firestop systems that are produced and installed to resist
41 the spread of fire, passage of smoke and other hot gases according to requirements indicated, to
42 restore the original fire-resistance rating of barrier penetrated.

43 1. Provide and install complete penetration firestopping systems that have been tested and
44 approved by nationally accepted testing agencies per ASTM E 814 or UL 1479 fire tests in a
45 configuration that is representative of field conditions.

46 2. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as
47 determined per ASTM E 814 or UL 1479, but not less than one (1) hour or the fire resistance
48 rating of the barrier being penetrated.

49 3. T-Rated Systems: Provide through-penetration firestop systems with T-ratings indicated, as
50 well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the
51 Building Code.

52 4. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-
53 resistant through-penetration firestop systems.

- 1 5. For penetrations involving insulated piping, provide through-penetration firestop systems not
2 requiring removal of insulation.
3
4 B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as
5 determined by UL 2079 (ASTM E 1399 and E 1966), but not less than the fire resistance rating of
6 the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding
7 anticipated movements for the installed field conditions.
8 1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide
9 products that after curing do not deteriorate when exposed to these conditions both during
10 and after construction.
11 2. For floor penetrations exposed to possible loading and traffic, provide firestop systems
12 capable of supporting floor loads involved either by installing floor plates or by other means.
13
14 C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less
15 than 450, as determined per ASTM E 84.
16
17 D. Where there is no specific third party tested and classified firestop system available for an installed
18 condition, the firestopping contractor shall obtain from the firestopping material manufacturer an
19 Engineering Judgment (EJ) to be submitted to the Approving Authority and Authority Having
20 Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council
21 (IFC) guidelines.
22
23 1.06 SUBMITTALS
24
25 A. Submit in accordance with general conditions of this contract.
26
27 B. Product Data: For each type of firestopping product selected. Certify that firestopping materials are
28 asbestos free and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.
29
30 C. Design Listings: Submit system design listings, including illustrations, from a qualified testing and
31 inspecting agency that is applicable to each firestop configuration.
32
33 D. Where there is no specific third party tested and classified firestop system available for a particular
34 configuration, the firestopping contractor shall obtain from the firestopping material manufacturer an
35 Engineering Judgment (EJ) for submittal.
36
37 E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate
38 their capabilities and experience. Submit document from manufacturer wherein manufacturer
39 recognizes the installer as qualified.
40
41 1.07 QUALITY ASSURANCE
42
43 A. Provide firestopping system design listings from UL or OPL in accordance with the appropriate
44 ASTM Standard(s) per article 1.5.
45
46 B. Contractor Qualifications: An acceptable installer shall meet any two of the following requirements:
47 1. Licensed by State or Local Authority where applicable.
48 2. Trained and approved by the firestop manufacturer.
49 3. Shown to have successfully completed not less than 5 comparable scale projects.
50
51 C. Single Source Limitations: Obtain firestop systems, for each kind of penetration and construction
52 condition indicated from a single manufacturer, where possible.
53

- 1 D. Materials from different firestop manufacturers shall not be installed in the same firestop system or
2 opening.
3
- 4 E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of
5 hazardous solvents.
6
- 7 F. Firestopping sealants must be flexible, allowing for normal pipe movement.
8
- 9 G. Firestopping materials shall not crack or pull back from contact surfaces such that a void is created.
10
- 11 H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
12
- 13 I. Materials used shall be in accordance with the manufacturer's written installation instructions.
14
- 15 J. Label each firestopping system installation with the following information:
16 1. Firestopping product name
17 2. System listing number
18 3. Name and address of manufacturer
19
- 20 K. Inspection of penetrations through fire rated floor and wall assemblies shall be in accordance with
21 ASTM E 2174, Standard Practice for On-Site Inspection of Installed Fire Stops.
22
- 23 L. Inspection of fire resistive joints and perimeter barriers shall be in accordance with ASTM E 2393,
24 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire
25 Barriers
26
- 27 1.08 DELIVERY, STORAGE, AND HANDLING
- 28
- 29 A. Deliver firestopping products to Project site in original, unopened containers or packages with intact
30 and legible manufacturer's labels identifying product and manufacturer, date of manufacture, lot
31 number, UL or OPL classification marking, and mixing instructions for multi-component materials.
32
- 33 B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to
34 moisture, temperature changes, contaminants, or other causes.
35
- 36 C. All firestop materials shall be installed prior to expiration of shelf life.
37
- 38 1.09 PROJECT CONDITIONS
- 39
- 40 A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within
41 limits permitted by the manufacturer's written instructions. Do not install firestopping when
42 substrates are wet due to rain, frost, condensation, or other causes.
43
- 44 B. Ventilate per the manufacturer's written instructions on the product's Material Safety Data Sheet.
45
- 46 C. Verify the condition of the substrates before starting work.
47
- 48 D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate
49 adjacent surfaces.
50
- 51 1.10 COORDINATION
- 52

- 1 A. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are
2 installed according to specified requirements.
3
4 B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-
5 penetration firestop systems.
6
7 C. Do not conceal firestopping installations until the Owner’s inspection agency or Authorities Having
8 Jurisdiction have examined each installation.
9
10 D. Schedule firestopping after installation of penetrants but prior to concealing the openings.

11
12 1.11 ENVIRONMENTAL REQUIREMENTS

- 13
14 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
15 (defined as inside the weatherproofing system and applied on site) must not exceed the following
16 requirements.
17 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
18 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
19 2005.
20 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
21 effect on October 19, 2000.
22
23

24 PART 2 - PRODUCTS

25
26 2.01 FIRESTOPPING, GENERAL

- 27
28 A. Firestopping products specified in system design listings by UL or OPL may be used providing they
29 conform to the construction type, penetrant type, annular space requirements, and fire rating
30 involved in each separate assembly.
31
32 B. Manufacturer of firestopping products shall have been successfully producing and supplying these
33 products for a period of not less than three years and be able to show evidence of at least ten projects
34 where similar products have been installed and accepted.
35
36 C. Accessories: Provide components for each firestop system that are needed to install fill materials
37 and to comply with “Performance Requirements” Article. Use only components specified by the
38 firestopping manufacturer and approved by UL or OPL for the firestop systems indicated.
39 Accessories include, but are not limited to the following items:
40 1. Permanent forming/damming/backing materials, including the following:
41 a. Mineral wool insulation.
42 b. Foams or sealants used to prevent leakage of fill materials in liquid state.
43 c. Fire-rated form board.
44 d. Polyethylene/polyurethane backer rod.
45 e. Rigid polystyrene board.
46 f. Temporary forming materials.
47 g. Substrate primers.
48 h. Steel sleeves
49
50 D. All firestopping products and systems shall be designed and installed so that the basic sealing system
51 will allow the full restoration of the fire resistance properties of the barrier being penetrated with
52 minimal repair if penetrants are subsequently removed.
53

- 1 2.02 MIXING
2
3 A. For those products requiring mixing before application, comply with firestopping manufacturer's
4 written instructions for accurate proportioning of materials, water (if required), type of mixing
5 equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures
6 needed to produce products of uniform quality with optimum performance characteristics for
7 application indicated.
8
- 9 2.03 MANUFACTURERS
10
11 A. Subject to compliance with the requirements, provide products by one of the following:
12 1. Grace Construction Products, 62 Whittemore Ave, Cambridge MA 02140, (866) 333-3726.
13 2. Hilti USA; 5400 S. 122nd E. Ave, Tulsa, OK 74146 (800) 445-8827
14 3. 3M Fire Protection; 3M Center, St. Paul, MN 55144 (888) 364-3577
15 4. Or Approved Equal.
16
- 17 2.04 MATERIALS
18
19 A. Intumescent Firestop Sealants and Caulks:
20 1. FlameSafe FS1900
21 2. Or Approved Equal
22
23 B. Elastomeric Water-Based Sealant:
24 1. FlameSafe FS1900, FS900
25 2. Or Approved Equal
26
27 C. Elastomeric Silicone Sealant:
28 1. FlameSafe Silicone
29 2. Or Approved Equal
30
31 D. Firestop Putty:
32 1. FlameSafe FSP1000 Putty & FSP1077 Putty Pads
33 2. Or Approved Equal
34
35 E. Firestop Devices:
36 1. FlameSafe FSWS Collar, FSIS Intumescent Sleeve, FlameSafe FSD Device
37 2. Or Approved Equal
38
39 F. Wrap Strips:
40 1. FlameSafe FSWS 100 Wrap Strip, FSWS 150 Wrap Strip
41 2. Or Approved Equal
42
43 G. Firestop Mortars:
44 1. FlameSafe FSM Mortar
45 2. Or Approved Equal
46
47 H. Firestop Bags/Pillows:
48 1. FlameSafe Bags, FlameSafe Pillows
49 2. Or Approved Equal
50
51 I. Elastomeric Coating:
52 1. FlameSafe FS3000
53 2. Or Approved Equal

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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.

3.03 PENETRATION FIRESTOP SYSTEMS

- A. General: Install through-penetration firestop systems to comply with “Performance Requirements” article in Part 1 and firestopping manufacturer’s written installation instructions and published drawings for products and applications indicated.
- B. Installation of firestopping shall be performed by an applicator/installer qualified as described in article 1.7.
- C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer’s EJ per the manufacturer’s installation instructions.
- D. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.
- E. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 JOINT FIRESTOP SYSTEMS

General: Install fire resistive joint firestop systems to comply with “Performance Requirements” article in Part 1 and firestopping manufacturer’s written installation instructions and published drawings for products and

1 applications indicated. System to meet UL2079-"Tests for Fire Resistance of Building Joint Systems.

- 2
- 3 A. Installation of firestopping shall be performed by an applicator/installer qualified as described in
- 4 article 1.7.
- 5
- 6 B. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer's
- 7 Engineered Judgment per the manufacturer's installation instructions.
- 8
- 9 C. Install joint forming/damming materials and other accessories required to support fill materials
- 10 during their application and in the position needed to produce cross-sectional shapes and depths of
- 11 installed firestopping material relative to joint widths that allow optimum movement capability and
- 12 achieve fire resistance ratings required.
- 13
- 14 D. Install fill materials for firestop systems by proven techniques to produce the following results:
- 15 1. Fill joint as required to achieve fire-resistance ratings indicated.
- 16 2. Apply materials so they fully contact and adhere to substrates forming the openings.
- 17 3. Completely fill recesses provided for each joint configuration.
- 18 4. Tool non-sag firestop materials after their application and prior to the time skinning begins.
- 19 Use tooling agents approved by the firestopping manufacturer.
- 20

21 3.05 PERIMETER BARRIER FIRESTOP SYSTEMS

22

- 23 A. General: Install perimeter barrier firestop systems to comply with "Performance Requirements"
- 24 article in Part 1 and firestopping manufacturer's written installation instructions and published
- 25 drawings for products and applications indicated.
- 26
- 27 B. Installation of firestopping shall be performed by an applicator/installer qualified as described in
- 28 article 1.7.
- 29
- 30 C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer's EJ per the
- 31 manufacturer's installation instructions.
- 32
- 33 D. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop
- 34 materials as applicable within the system design.
- 35

36 3.06 FIELD QUALITY CONTROL

37

- 38 A. All penetrations shall maintain the fire rating of the assembly through which they pass by the use of
- 39 UL, OPL, or Engineered Judgement firestopping systems.
- 40

41 3.07 CLEANING AND PROTECTION

42

- 43 A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with
- 44 cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not
- 45 damage materials in which openings occur. Leave finished work in neat, clean condition with no
- 46 evidence of spillovers or damage to adjacent surfaces.
- 47
- 48 B. Provide final protection and maintain conditions during and after installation that ensure firestop
- 49 systems are without damage or deterioration at time of Substantial Completion. If, despite such
- 50 protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop
- 51 systems immediately and install new materials to produce firestop systems complying with specified
- 52 requirements.
- 53

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END OF SECTION 07 84 00

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Miscellaneous Joints.
- B. Floor Joints (interior).
- C. Wall Joints (exterior).

1.03 RELATED WORK

- A. Section 07 62 00, Sheet Metal Flashing and Trim.
- B. Section 08 11 13, Steel Doors and Frames.
- C. Section 08 41 13, Aluminum-Framed Entrances and Storefronts.
- D. Section 09 29 00, Gypsum Board.
- E. Section 09 30 00, Tiling

1.04 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for initial selection: Manufacturer's color charts.
- C. Samples for final selection: Custom color range of actual material for selection.
- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Field-Adhesion Test Reports: For each sealant application tested.
- F. Warranties: Sample of special warranties.

1.05 PRECONSTRUCTION TESTING

- 1 A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for
2 testing indicated below, samples of materials that will contact or affect joint sealants.
3 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation
4 techniques are required to obtain rapid, optimum adhesion of joint sealants to joint
5 substrates.
6 2. Submit quantity required by joint sealant manufacturer of each kind of material, including
7 joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous
8 materials.
9 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
10 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for
11 corrective measures including use of specially formulated primers.
12 5. Retain subparagraph below if generic test data are acceptable.
13 6. Testing will not be required if joint-sealant manufacturers submit joint preparation data
14 that are based on previous testing, not older than 24 months, of sealant products for
15 adhesion to, and compatibility with, joint substrates and other materials matching those
16 submitted.
17
- 18 B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to
19 Project joint substrates as follows:
20 1. Locate test joints where indicated on Project or, if not indicated, as directed by A/E.
21 2. Conduct field tests for each application indicated below:
22 a. Each kind of sealant and joint substrate indicated.
23 1) Existing masonry.
24 2) Existing metal panel.
25 3) Where new work abuts materials listed above.
26
27 3. Notify A/E seven days in advance of dates and times when test joints will be erected.
28 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative
29 present.
30 a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant
31 Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail
32 Procedure, in ASTM C 1521.
33 1) For joints with dissimilar substrates, verify adhesion to each substrate
34 separately; extend cut along one side, verifying adhesion to opposite side.
35 Repeat procedure for opposite side.
36
37 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data
38 on pull distance used to test each kind of product and joint substrate. For sealants that fail
39 adhesively, retest until satisfactory adhesion is obtained.
40
41 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing
42 adhesive failure from testing, in absence of other indications of noncompliance with
43 requirements, will be considered satisfactory. Do not use sealants that fail to adhere to
44 joint substrates during testing.

44 1.06 QUALITY ASSURANCE

- 45
46 A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved
47 for installation of units required for this Project.
48
49 B. Source Limitations: Obtain each kind of joint sealant from single source from single
50 manufacturer.
51
52 C. Product Testing: Test joint sealants using a qualified testing agency.

- 1 1. Testing Agency Qualifications: An independent testing agency qualified according to
2 ASTM C 1021 to conduct the testing indicated.
- 3 2. Test according to SWRI's Sealant Validation Program for compliance with requirements
4 specified by reference to ASTM C 920 for adhesion and cohesion under cyclic
5 movement, adhesion-in-peel, and indentation hardness.
- 6
- 7 1.07 PROJECT CONDITIONS
- 8
- 9 A. Examine the joint surfaces and backing, and their anchorage to the structure, and the conditions
10 under which the joint sealer work is to be performed. Do not proceed with the joint sealer work
11 until unsatisfactory conditions have been corrected.
- 12
- 13 B. Do not proceed with installation of sealants under adverse weather conditions, or when
14 temperatures are below or above manufacturer's recommended limitations for installation.
15 Proceed with the work only when forecasted weather conditions are favorable for proper cure
16 and development of high early bond strength. Wherever joint width is affected by ambient
17 temperature variations, install sealants only when temperatures are in the lower third of
18 manufacturer's recommended installation temperature range.
- 19
- 20 1.08 WARRANTY
- 21
- 22 A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or
23 replace joint sealants that do not comply with performance and other requirements specified in
24 this Section within specified warranty period.
- 25 1. Warranty Period: Two years from date of Substantial Completion.
- 26
- 27 B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant
28 manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with
29 performance and other requirements specified in this Section within specified warranty period.
- 30 1. Warranty Period: Five years from date of Substantial Completion.
- 31
- 32 C. Special warranties specified in this article exclude deterioration or failure of joint sealants from
33 the following:
- 34 1. Movement of the structure caused by structural settlement or errors attributable to design
35 or construction resulting in stresses on the sealant exceeding sealant manufacturer's
36 written specifications for sealant elongation and compression.
- 37 2. Disintegration of joint substrates from natural causes exceeding design specifications.
- 38 3. Mechanical damage caused by individuals, tools, or other outside agents.
- 39 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric
40 contaminants.
- 41
- 42 1.09 ENVIRONMENTAL REQUIREMENTS
- 43 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
44 (defined as inside the weatherproofing system and applied on site) must not exceed the following
45 requirements.
- 46
- 47 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
48 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
49 date January 7, 2005.
- 50 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
51 in effect on October 19, 2000.
- 52
- 53

1 PART 2 - PRODUCTS

2
3 2.01 MATERIALS, GENERAL

- 4
5 A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible
6 with one another and with joint substrates under conditions of service and application, as
7 demonstrated by joint-sealant manufacturer, based on testing and field experience.
8
9 B. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous
10 substrates, provide products that have undergone testing according to ASTM C 1248 and have
11 not stained porous joint substrates indicated for Project.
12
13 C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in
14 repeated contact with food, provide products that comply with 21 CFR 177.2600.
15
16 D. Colors of Exposed Joint Sealants: As selected by A/E from manufacturer's full range, or custom
17 colors where indicated.
18

19 2.02 SILICONE JOINT SEALANTS

- 20
21 A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade
22 NS, Class 100/50, for Use NT.
23 1. Products: Subject to compliance with requirements, available products that may be
24 incorporated into the Work include, but are not limited to, the following:
25 a. Dow Corning Corporation; 790.
26 b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
27 c. May National Associates, Inc.; Bondaflex Sil 290.
28 d. Pecora Corporation; 301 NS.
29 e. Sika Corporation, Construction Products Division; SikaSil-C990.
30 f. Tremco Incorporated; Spectrem 1.
31
32 B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920,
33 Type S, Grade NS, Class 100/50, for Use T.
34 1. Products: Subject to compliance with requirements, available products that may be
35 incorporated into the Work include, but are not limited to, the following:
36 a. Dow Corning Corporation; NS Parking Structure Sealant.
37 b. May National Associates, Inc.; Bondaflex Sil 728 NS.
38 c. Pecora Corporation; 311 NS.
39 d. Tremco Incorporated; Spectrem 800.
40
41 C. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade
42 NS, Class 25, for Use NT.
43 1. Products: Subject to compliance with requirements, available products that may be
44 incorporated into the Work include, but are not limited to, the following:
45 a. Dow Corning Corporation; 799.
46 b. GE Advanced Materials - Silicones; UltraGlaze SSG4000 or UltraGlaze
47 SSG4000AC.
48 c. May National Associates, Inc.; Bondaflex Sil 200 GPN or Bondaflex Sil 201 FC.
49 d. Polymeric Systems, Inc.; PSI-631.
50 e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
51 f. Tremco Incorporated; Proglaze SSG or Tremsil 600.
52

- 1 D. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS,
2 Class 50, for Use NT.
3 1. Products: Subject to compliance with requirements, available products that may be
4 incorporated into the Work include, but are not limited to, the following:
5 a. Tremco Incorporated; Spectrem 4TS.
6
- 7 E. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920,
8 Type S, Grade NS, Class 25, for Use NT.
9 1. Products: Subject to compliance with requirements, available products that may be
10 incorporated into the Work include, but are not limited to, the following:
11 a. Pecora Corporation; 898.
12
- 13 2.03 LATEX JOINT SEALANTS
14
- 15 A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP,
16 Grade NF.
17
- 18 1. Products: Subject to compliance with requirements, available products that may be
19 incorporated into the Work include, but are not limited to, the following:
20 a. BASF Building Systems; Sonolac.
21 b. Bostik, Inc. Chem-Chal 600.
22 c. Pecora Corporation; AC-20+.
23 d. Tremco Incorporated; Tremflex 834.
24
- 25 2.04 PREFORMED JOINT SEALANTS
26
- 27 A. A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low
28 modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing
29 silicone sealant for bonding extrusions to substrates.
30
- 31 2.05 SEALANT ACCESSORIES
32
- 33 A. Primer: When required, as recommended by the Sealant Manufacturer.
34
- 35 B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants
36 and sealant backing materials, free of oily residues or other substances capable of staining or
37 harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote
38 optimum adhesion of sealants to joint substrates.
39
- 40 C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces
41 adjacent to joints.
42
- 43 D. Joint Sealant Backing:
44
- 45 1. General: Provide sealant backings of material that are nonstaining; are compatible with joint
46 substrates, sealants, primers, and other joint fillers; and are approved for applications
47 indicated by sealant manufacturer based on field experience and laboratory testing.
48 2. Closed Cell Back-up (Backer Rod): ASTM C 1330, Type C.
49 a. Tremco "Closed Cell Backer Rod".
50 b. Sonneborn "Sonofoam".
51 c. W.R. Meadows "Kool-Rod".
52

- 1 3. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant
2 manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or
3 joint surfaces at back of joint. Provide self-adhesive tape where applicable.
4

5
6 PART 3 - EXECUTION

7
8 3.01 EXAMINATION

- 9
10 A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with
11 requirements for joint configuration, installation tolerances, and other conditions affecting joint-
12 sealant performance.
13
14 B. Proceed with installation only after unsatisfactory conditions have been corrected.
15

16 3.02 JOINT PREPARATION

- 17
18 A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings,
19 moisture and other substances which would interfere with bond of sealant. Etch concrete and
20 masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed
21 joint surfaces as recommended by sealant manufacturer.
22
23 B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer.
24 Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
25

26 3.03 SEALANT APPLICATION, GENERAL

- 27
28 A. General: Comply with joint-sealant manufacturer's written installation instructions for products
29 and applications indicated, unless more stringent requirements apply.
30 B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint
31 sealants as applicable to materials, applications, and conditions indicated.
32
33 C. Set joint filler units at proper depth or position in the joint to coordinate with other work,
34 including the installation of bond breakers, backer rods and sealants.
35
36 1. Do not leave voids or gaps between the ends of joint filler units.
37 2. Do not stretch, twist, puncture, or tear sealant backings.
38 3. Remove absorbent sealant backings that have become wet before sealant application and
39 replace them with dry materials.
40
41 D. Install bond breaker tape wherever shown and wherever required by manufacturer's
42 recommendations to ensure that elastomeric sealants will perform properly.
43
44 E. Apply compound with a gun having proper size nozzle or with a knife, as required. Use
45 sufficient pressure to fill all voids and joints solid. Remove excess sealant and leave surfaces
46 smooth, neat and clean. Upon completion sealant shall have a smooth, even finish and all joints
47 shall be weathertight. All work shall be in accordance with manufacturer's printed instructions.
48
49 F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing
50 begins, tool sealants according to requirements specified in subparagraphs below to form
51 smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact
52 and adhesion of sealant with sides of joint.
53

- 1 1. Remove excess sealant from surfaces adjacent to joints.
- 2 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not
- 3 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- 4 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
- 5 5. Provide recessed joint configuration of recess depth and at locations indicated per
- 6 7. Figure 8C in ASTM C 1193.
- 7 a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- 8
- 9
- 10 G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal
- 11 construction at perimeters, behind control joints, and at openings and penetrations with a
- 12 continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at
- 13 perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's
- 14 written recommendations. Refer to Section 09 29 00 for product.
- 15
- 16 H. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate
- 17 into the voids of adjoining surfaces. Clean the adjoining surfaces by whatever means may be
- 18 necessary to eliminate evidence of spillage.
- 19
- 20 3.04 FIELD QUALITY CONTROL
- 21
- 22 A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
- 23 1. Extent of Testing: Test completed and cured sealant joints as follows:
- 24 a. Perform 5 tests for the first 1000 feet of joint length for each kind of exterior
- 25 sealant and joint substrate.
- 26 b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor
- 27 per elevation.
- 28
- 29 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint
- 30 Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in
- 31 ASTM C 1521.
- 32 a. For joints with dissimilar substrates, verify adhesion to each substrate separately;
- 33 extend cut along one side, verifying adhesion to opposite side. Repeat procedure
- 34 for opposite side.
- 35
- 36 3. Inspect tested joints and report on the following:
- 37 a. Whether sealants filled joint cavities and are free of voids.
- 38 b. Whether sealant dimensions and configurations comply with specified
- 39 requirements.
- 40 c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint
- 41 substrates or tore cohesively. Include data on pull distance used to test each kind
- 42 of product and joint substrate. Compare these results to determine if adhesion
- 43 passes sealant manufacturer's field-adhesion hand-pull test criteria.
- 44
- 45 4. Record test results in a field-adhesion-test log. Include dates when sealants were
- 46 installed, names of persons who installed sealants, test dates, test locations, whether joints
- 47 were primed, adhesion results and percent elongations, sealant fill, sealant configuration,
- 48 and sealant dimensions.
- 49 5. Repair sealants pulled from test area by applying new sealants following same procedures
- 50 used originally to seal joints. Ensure that original sealant surfaces are clean and that new
- 51 sealant contacts original sealant.
- 52

1 B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from
2 testing or noncompliance with other indicated requirements will be considered satisfactory.
3 Remove sealants that fail to adhere to joint substrates during testing or to comply with other
4 requirements. Retest failed applications until test results prove sealants comply with indicated
5 requirements.
6

7 3.05 PROTECTION

8
9 A. Cure sealants in compliance with manufacturer's instructions and recommendations. Advise the
10 Contractor of procedures required for the cure and protection of joint sealers during the
11 construction period, so that they will be without deterioration or damage (other than normal wear
12 and weathering) at the time of Substantial Completion.
13

14 3.06 JOINT-SEALANT COLOR SCHEDULE

15
16 1. Provide different sealant colors, as selected by A/E from manufacturer's full range of colors,
17 at the following joint locations, and as specified in related Sections:
18 a. Cast-in-place concrete
19 b. Metal Panels
20 c. Aluminum-framed entrances and storefronts.
21

22
23

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Hollow Metal Doors.
B. Hollow Metal Frames.

1.03 RELATED WORK

- A. Joint Sealants: Section 07 92 00.
B. Flush Wood Doors: Section 08 14 16.
C. Door Hardware: Section 08 71 00.
D. Glass and Glazing: Section 08 80 00.
E. Painting: Section 09 90 00.
F. Electrical: Division 26, for conduit in frames for door hardware.

1.04 REFERENCES

- A. Comply with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
B. Fire-Rated Doors: Comply with NFPA 80 "Standard for Fire Doors and Windows." and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
C. ANSI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
D. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings
E. ANSI A250.5 Accelerated Physical Endurance Test Procedure for Steel Doors, Frames, and Frame Anchors
F. ANSI A250.6 Hardware on Steel Doors (Reinforcement --Application)
G. ANSI A250.8 Nomenclature for Standard Steel Doors and Steel Door Frames

- 1
- 2 H. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for
- 3 Steel Doors and Frames
- 4
- 5 I. ANSI/DHI A115 Specifications for Hardware Preparations in Standard Steel Doors and Frames
- 6
- 7 J. ANSI/DHI A115.1G Installation Guide for Doors and Hardware
- 8
- 9 K. SDI-Steel Door Institute
- 10
- 11 L. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
- 12
- 13 M. ASTM A240/A240M Standard Specification for Heat-Resisting Chromium and Chromium-
- 14 Nickel Stainless Steel
- 15
- 16 N. ASTM A366 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
- 17
- 18 O. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy,
- 19 Hot-Rolled and Cold-Rolled, General Requirements
- 20
- 21 P. ASTM A569 Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled
- 22 Sheet and Strip Commercial Quality
- 23
- 24 Q. ASTM A591 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for light Coating
- 25 Mass Applications
- 26
- 27 R. ASTM A620 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Drawing Quality,
- 28 Special Killed
- 29
- 30 S. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
- 31 Alloy-Coated (Galvanealed) by the Hot-Dip Process
- 32
- 33 T. ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated
- 34 by the Hot-Dip Process
- 35
- 36 U. ASTM E2074-00 Methods of Fire Tests of Door Assemblies.
- 37
- 38 V. NFPA 80: Fire Doors and Windows.
- 39
- 40 W. NFPA-101-94: Life Safety Code.
- 41
- 42 X. NFPA 251: Fire Tests of Building Construction and Materials.
- 43
- 44 Y. NFPA 252: Fire Tests of Door Assemblies.
- 45
- 46 Z. UL 9: Fire Tests of Door Assemblies.
- 47
- 48 AA. UL 10B: Fire Tests of Door Assemblies.
- 49
- 50 BB. UL 263: Fire Tests of Building Construction and Materials.
- 51
- 52 CC. UL 75: Bullet Resisting Equipment 11th Edition Dated Sept. 5, 2005.
- 53

- 1 DD. American Welding Society
2
3 1.05 SUBMITTALS
4
5 A. Submit in accordance with the General Conditions of the Contract.
6 1. Manufacturer's technical product data substantiating that products comply with
7 requirements.
8 2. Shop Drawings for fabrication and installation of steel doors and frames. Include details
9 of each frame type, elevations of door design types, conditions at openings, details of
10 construction, location and installation requirements of finish hardware and
11 reinforcements, and details of joints and connections. Show anchorage and accessory
12 items.
13 a. Provide schedule of doors and frames using same reference numbers for details
14 and openings as those on contract drawings.
15 b. Indicate coordination of glazing frames and stops with glass and glazing
16 requirements.
17 c. Submittal to include fully coordinated installation of Detail 4A715 to provide 90-
18 degree angle of hold open door.
19
20 3. Oversize Construction Certification: For assemblies required to be fire rated and exceeding
21 limitations of labeled assemblies.
22
23 4. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
24 testing agency, for each type of hollow metal door and frame assembly.
25
26 1.06 QUALITY ASSURANCE
27
28 A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
29
30 B. Fire-Rated Door Assemblies: Label, testing and installation of opening protectives shall be in
31 accordance with Wisconsin Building Code Section 715.
32
33 C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
34
35 1.07 DELIVERY, STORAGE, AND HANDLING
36
37 A. Deliver hollow metal work cartoned or crated to provide protection during transit and job
38 storage.
39 1. Provide additional protection to prevent damage to finish of factory-finished units.
40
41 B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to
42 jambs and mullions.
43
44 C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided
45 refinished items are equal in all respects to new work and acceptable to Construction Manager;
46 otherwise, remove and replace damaged items as directed.
47
48 D. Store doors and frames at building site under cover. Place units on minimum 4 inch high wood
49 blocking. Avoid use of non-vented plastic or canvas shelters which could create a humidity
50 chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4
51 inch spaces between stacked doors to promote air circulation.
52
53 1.08 PROJECT CONDITIONS

- 1
2 A. Examine the openings and conditions under which hollow metal work is to be installed. Do not
3 proceed with the work until unsatisfactory conditions have been corrected.
4

5
6 PART 2 - PRODUCTS

7
8 2.01 MANUFACTURERS, HOLLOW METAL

- 9
10 A. Amweld Building Products
11
12 B. Ceco Door Products
13
14 C. Curries Company
15
16 D. Kewaunee Corporation
17
18 E. Mesker Door, Inc.
19
20 F. Steelcraft
21
22 G. Or approved equal.

23
24 2.02 MATERIALS

- 25
26 A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for
27 exposed applications.
28
29 B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale,
30 pitting, or surface defects; pickled and oiled.
31
32 C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill
33 phosphatized.
34 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008 or
35 ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
36
37 D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
38
39 E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated,
40 fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching
41 hollow metal frames of type indicated.
42
43 F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of
44 fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum
45 flamespread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for
46 combustion characteristics.
47
48 G. Glazing: Comply with requirements in Division 08 Section "Glazing."
49
50 H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film
51 thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur
52 components, and other deleterious impurities.
53

- 1 I. Steel: Commercial quality, level, cold-rolled steel conforming to ASTM A366, free of scale and
2 surface defects. Commercial quality hot rolled and pickled steel conforming to ASTM A569
3 may be used as option for interior frames. Standard hollow metal frame gauges are as follows
4 (Bullet Resistant must meet specified resistance level):
5 1. Interior Frames: 16-gage.
6 2. Exterior Frames: 14-gage.
7 3. Flush Doors: 16-gage (exterior), 18-gage (interior).
8 4. Rough Bucks and Stiffeners: 12-gage.
9 5. Miscellaneous Trim: 16 gage.
- 10
11 2.03 FABRICATION, GENERAL
12
13 A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal
14 to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and
15 assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify
16 work that cannot be permanently factory assembled before shipment.
17
18 B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
19
20 C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-
21 rolled steel sheet.
22
23 D. Fabricate doors to a maximum tolerance of 1/16 inch from a straight edge when laid on face of
24 door in any direction, including diagonal.
25
26 E. Provide proper Underwriters' Laboratory (UL) labels. Labeled doors shall have equal labeled
27 frames.
28
29 F. Clearances
30 1. Edge clearances shall be provided as follows:
31 a. Between doors and frame, at head and jambs - 1/8 inch.
32 b. At door sills:
33 1) Where no threshold is used - 3/8 minimum.
34 2) Where threshold is used - 1/4 inch maximum between door & threshold.
35
36 G. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware;
37 include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware
38 Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
39 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
40 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door
41 hardware.
42 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series
43 specifications for preparation of hollow metal work for hardware.
44 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26
45 Sections.
46
47 H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners
48 of stops and moldings with butted or mitered hairline joints.
49 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal
50 work. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each
51 glazed lite is capable of being removed independently.
52 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
53 frames.

- 1 3. Provide loose stops and moldings on inside of hollow metal work. Coordinate rabbet width
2 between fixed and removable stops with type of glazing and type installation indicated.
3

4 2.04 HOLLOW METAL FRAME FABRICATION
5

- 6 A. Provide metal frames of the types and styles indicated on the drawings or schedules and
7 complying with SDI for materials and construction requirements.
8
9 B. Provide metal frames for doors, transoms, sidelights, borrowed lites, and other openings, as
10 shown on drawings.
11
12 C. Provide integral channel frames, sub frames and stiffeners to structure where indicated or
13 required for fastening and stiffening frames.
14
15 D. Provide steel spreader temporarily attached to feet of both jambs for welded frames.
16
17 E. Completely clean all frames by degreasing process, followed by one coat rust inhibitive primer
18 equal to withstand a salt spray test (5% solution) of 70 hours. Thoroughly prime all surfaces
19 without runs, smears, or bare spots, and under and inside all removable stops.
20
21 F. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment
22 plates or angles at each joint, fabricated of same thickness metal as frames.
23
24 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth,
25 flush, and invisible.
26 2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints,
27 fabricated from same material as door frame. Fasten members at crossings and to jambs by
28 butt welding.
29 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners
30 unless otherwise indicated.
31 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
32 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds
33 per anchor.
34 6. Jamb Anchors: Provide number and spacing of anchors as follows:
35 a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of
36 frame. Space anchors not more than 32 inches o.c. and as follows:
37 1) Two anchors per jamb up to 60 inches high.
38 2) Three anchors per jamb from 60 to 90 inches high.
39 3) Four anchors per jamb from 90 to 120 inches high.
40 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or
41 fraction thereof above 120 inches high.
42
43 b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of
44 frame. Space anchors not more than 32 inches o.c. and as follows:
45 1) Three anchors per jamb up to 60 inches high.
46 2) Four anchors per jamb from 60 to 90 inches high.
47 3) Five anchors per jamb from 90 to 96 inches high.
48 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or
49 fraction thereof above 96 inches high.
50 5) Two anchors per head for frames above 42 inches wide and mounted in metal-
51 stud partitions.
52
53 c. Compression Type: Not less than two anchors in each jamb.

- 1 d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and
2 bottom of frame. Space anchors not more than 26 inches o.c.
3
- 4 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as
5 follows. Keep holes clear during construction.
6 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
7 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
8
- 9 2.05 HOLLOW METAL DOOR FABRICATION
- 10
- 11 A. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not
12 less than 16-gauge, full width spot welded to both faces.
13
- 14 B. All doors to be flush with seamless edges i.e., provide continuous flush end closures,
15 continuously welded in place and ground smooth.
16
- 17 C. Hardware location per manufacturer recommended heights to meet ADA requirements.
18
- 19 D. Completely clean all doors of impurities and pressure sand to a smooth surface and correct all
20 irregularities with metallic putty sanded smooth. Provide one spray coat of primer, baked on.
21 Thoroughly paint unexposed inside surfaces of exterior doors, fire doors, and other doors
22 occurring in excessive moisture area.
23
- 24 E. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to
25 escape. Seal joints in top edges of doors against water penetration.
26
- 27 F. Glazed Lites: Factory cut openings in doors.
28
- 29 G. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80
30 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door
31 on which astragal is mounted.
32
- 33 2.06 STANDARD HOLLOW METAL DOORS
- 34
- 35 A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth
36 surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with
37 ANSI/SDI A250.8.
38 1. Design: As indicated.
39 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene,
40 polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
41 a. Fire Door Core: As required to provide fire-protection ratings indicated.
42 b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with
43 thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when
44 tested according to ASTM C 1363.
45 1) Locations: Exterior doors and doors that connect the main (office and Medical
46 Examiner Suite) portion of the building to Garage, 150.
47
- 48 3. Vertical Edges for Single-Acting Doors: Beveled edge.
49 a. Beveled Edge: 1/8 inch in 2 inches.
50
- 51 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or
52 channels of same material as face sheets.

- 1 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Door and
2 Frames."
3
- 4 B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying
5 with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and
6 ANSI/SDI A250.4 for physical performance level:
7 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
8
- 9 C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with
10 requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI
11 A250.4 for physical performance level:
12 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
13
- 14 D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from
15 same material as door face sheets.
16
- 17 E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
18
- 19 2.07 STANDARD HOLLOW METAL FRAMES
20
- 21 A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
22
- 23 B. Exterior Frames: Fabricated from metallic-coated steel sheet.
24 1. Fabricate frames with mitered or coped corners.
25 2. Fabricate frames as face welded unless otherwise indicated.
26 3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
27
- 28 C. Interior Frames: Fabricated from cold-rolled steel sheet.
29 1. Fabricate frames with mitered or coped corners.
30 2. Fabricate frames as face welded unless otherwise indicated.
31 3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
32 4. Frames for Wood Doors: 0.053-inch-thick steel sheet.
33 5. Frames for Borrowed Lights: Same as adjacent door frame.
34
- 35 D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from
36 same material as frames.
37
- 38 2.08 FRAME ANCHORS
39
- 40 A. Jamb Anchors:
41 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch
42 thick.
43 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
44
- 45 B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
46 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
47 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not
48 less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
49
- 50 2.09 STOPS AND MOLDINGS
51
- 52 A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as
53 door face sheet in which they are installed.

- 1
2 B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high
3 unless otherwise indicated.
4
5 C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material
6 as frames in which they are installed.
7
8 D. Cut-Off Stops:
9 1. Angled stop terminates 6-inches above the floor, closed at a 45 degree angle.
10 2. See Door Schedule for locations.
11
12 2.010 STEEL FINISHES
13
14 A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
15 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying
16 with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for
17 substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
18 2. Ensure primer is compatible with finish coats scheduled.
19
20
21 PART 3 - EXECUTION
22
23 3.01 EXAMINATION
24
25 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
26 for installation tolerances and other conditions affecting performance of the Work.
27
28 B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame
29 installation.
30
31 C. Proceed with installation only after unsatisfactory conditions have been corrected.
32
33 3.02 PREPARATION
34
35 A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding,
36 filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
37
38 B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness,
39 alignment, twist, and plumbness to the following tolerances:
40 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb
41 perpendicular to frame head.
42 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane
43 of wall.
44 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines,
45 and perpendicular to plane of wall.
46 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to
47 floor.
48
49 C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door
50 hardware.
51
52 3.03 INSTALLATION
53

- 1 A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place;
2 comply with Drawings and manufacturer's written instructions.
3
- 4 B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with
5 ANSI/SDI A250.11.
6 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent
7 anchors are set. After wall construction is complete, remove temporary braces, leaving
8 surfaces smooth and undamaged.
9 a. At fire-protection-rated openings, install frames according to NFPA 80.
10 b. Where frames are fabricated in sections because of shipping or handling limitations,
11 field splice at approved locations by welding face joint continuously; grind, fill, dress,
12 and make splice smooth, flush, and invisible on exposed faces.
13 c. Install frames with removable glazing stops located on secure side of opening.
14 d. Install door silencers in frames before grouting.
15 e. Remove temporary braces necessary for installation only after frames have been
16 properly set and secured.
17 f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as
18 necessary to comply with installation tolerances.
19 g. Field apply bituminous coating to backs of frames that are filled with grout containing
20 antifreezing agents.
21
- 22 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and
23 secure with postinstalled expansion anchors.
24 a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled
25 expansion anchors if so indicated and approved on Shop Drawings.
26
- 27 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
28 4. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural
29 supports or substrates above frame unless frame is anchored to masonry or to other structural
30 support at each jamb. Bend top of struts to provide flush contact for securing to supporting
31 construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
32 5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist,
33 and plumb to the following tolerances:
34 a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees
35 from jamb perpendicular to frame head.
36 b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to
37 plane of wall.
38 c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on
39 parallel lines, and perpendicular to plane of wall.
40 d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
41
- 42 C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified
43 below. Shim as necessary.
44 1. Non-Fire-Rated Standard Steel Doors:
45 a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
46 b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
47 c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
48 d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
49
- 50 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
51 3. Smoke-Control Doors: Install doors according to NFPA 105.
52

- 1 D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow
2 metal manufacturer's written instructions\.
- 3 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more
4 than 9 inches o.c. and not more than 2 inches o.c. from each corner.
5
- 6 E. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames",
7 unless otherwise indicated.
- 8 1. Except for frames located at in-place concrete or masonry and at drywall installations,
9 place frames prior to construction of enclosing walls and ceilings. Set frames accurately
10 in position, plumbed, aligned, and braced securely until permanent anchors are set. After
11 wall construction is completed, remove temporary braces and spreaders leaving surfaces
12 smooth and undamaged.
- 13 2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
14 3. At in-place concrete or masonry construction, set frames and secure to adjacent
15 construction with machine screws and masonry anchorage devices.
16 4. Install fire-rated frames in accordance with NFPA Std. No. 80.
17 5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.
18 In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed
19 steel stud partitions, attach wall anchors to studs with self-tapping screws.
20 6. Fill heads of fasteners with body putty, grind smooth and touch-up prime.
21
- 22 F. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
23
- 24 G. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.
25
- 26 H. Install glazing in strict accordance with fire resistant glazing material manufacturer's
27 specifications. Field cutting or tampering is not permissible.
28
- 29 3.04 ADJUSTING AND CLEANING
30
- 31 A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply
32 touch-up of compatible air-drying primer.
33
- 34 B. Remove grout and other bonding material from hollow metal work immediately after installation.
35
- 36 C. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged
37 and in complete and proper operating condition. Remove and replace defective work, including
38 hollow metal work that is warped, bowed, or otherwise unacceptable.
39
40
- END OF SECTION 08 11 13

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SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Wood Doors.

1.03 RELATED WORK

- A. Section 08 11 13, Steel Doors & Frames
B. Section 08 71 00, Door Hardware
C. Section 08 80 00, Glazing

1.04 REFERENCES

- A. Reference Standards: Section 1300 of the Architectural Woodwork Institute (AWI). Door types specified in Part 2 below are AWI reference designations.
B. Doors: Obtained from a single manufacturer.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract
1. Manufacturer's product data, specifications and installation instructions for each type of wood door.
 2. 8" x 10" wood door sample with finish. For each color range, contractor to submit a minimum of (4) four samples representing light to dark variation for A/E selection.
 3. Color and finish to be chosen from manufacturer's full range.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "on-site care" recommendations of National Wood Window and Door Association (WDMA) pamphlet "Care and Finishing Wood Doors" and with manufacturer's instructions.
1. Provide protective coverings for doors at the factory prior to shipping. Use heavy paper cartons or poly bags and mark with identification required for proper installation.
- B. Deliver and store within enclosed building only after humidity contributing work is completed and relative humidity is less than 50%. Stack doors laid flat, level and off floor, in dry, clean, well ventilated space.
- C. Do not drag doors across one another.

- 1 1.07 WARRANTY
2
3 A. Submit in duplicate manufacturer's written warranty per NWWDA Standard Door warranty but
4 extending for life of installation for interior solid core doors.
5
6 1.08 ENVIRONMENTAL REQUIREMENTS
7
8 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied
9 on-site must meet the limitations and restrictions concerning chemical components set by the
10 following standards:
11 1. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
12 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
13 January 1, 2004.
14
15 B. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
16 (defined as inside the weatherproofing system and applied on site) must not exceed the following
17 requirements.
18 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
19 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
20 date January 7, 2005.
21 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
22 in effect on October 19, 2000.
23
24 C. Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and agrifiber
25 products used inside the weatherproofing system shall contain no added urea-formaldehyde
26 resins.
27 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
28 agrifiber assemblies shall contain no added urea-formaldehyde resins.
29
30
31 PART 2 - PRODUCTS
32
33 2.01 MANUFACTURERS
34
35 A. Algoma Hardwoods, Inc.; Algoma, Wisconsin; (920) 487-5221.
36
37 B. Eggers Industries; Two Rivers, Wisconsin: (920) 793-1351.
38
39 C. Marshfield Door Systems; Marshfield, Wisconsin: (800) 869-3667.
40
41 D. Oshkosh Architectural Door Company; Oshkosh, Wisconsin: (920) 233-6161.
42
43 E. VT Industries; Holstein, Iowa; (800) 827-1615.
44
45 2.02 MANUFACTURED UNITS
46
47 A. Door Construction General: WDMA I.S.1-A Performance Grade:
48 1. Heavy Duty unless otherwise noted.
49
50 B. Non-labeled Interior Wood Veneer Solid Core Doors: AWI type PC-5/7, Custom Grade.
51 1. Core: Particleboard or agri-fiber: ANSI A208.1, Grade LD-2.
52 2. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead
53 of particleboard cores for doors indicated to receive exit devices.
54

- 1 C. Labeled Interior Wood Veneer Solid Core Doors: AWI FD.
2 1. Edge Banding: Laminated.
3 2. Color: Factory finishes with edge seal. Custom Colors to match A/E's finish control samples.
4 3. Provide mineral core blocking at closers.
5
6 D. Structural-Composite-Lumber-Core Doors:
7 1. Structural Composite Lumber: WDMA I.S.10.
8 a. Screw Withdrawal, Face: 700 lbf.
9 b. Screw Withdrawal, Edge: 400 lbf.
10
11 E. Veneered-Faced Doors For Transparent Finish
12 1. Interior Solid-Core Doors:
13 a. Grade: Premium, with Grade A faces.
14 b. Species: WD-1 Select white maple.
15 c. Cut: Plain sliced (flat sliced).
16 d. Match between Veneer Leaves: Slip match.
17 e. Assembly of Veneer Leaves on Door Faces: Balance match.
18 f. Room Match: Match door faces within each separate room or area of building.
19 Corridor-door faces do not need to match where they are separated by 20 feet or
20 more.
21 g. Exposed Vertical Edges: Same species as faces or a compatible species.
22 h. Core: Particleboard, glued wood stave or structural composite lumber.
23 i. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive
24 planed before veneering. Faces are bonded to core using a hot press.
25
26 F. Light Frames
27 1. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood
28 beads as follows unless otherwise indicated.
29 a. Wood Species: Same species as door faces.
30 b. Profile: Flush rectangular beads.
31
32 2.03 FABRICATION
33
34 A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of
35 referenced quality standard for fitting unless otherwise indicated.
36
37 B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with
38 DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-
39 W series standards, ADA requirements and hardware templates.
40 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment
41 before factory machining.
42
43 C. Openings: Cut and trim openings through doors in factory.
44 1. Light Openings: Trim openings with moldings of material and profile indicated.
45 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with
46 applicable requirements in Division 08 Section "Glazing."
47
48 2.04 FACTORY FINISHING
49
50 A. General: Comply with referenced quality standard for factory finishing. Complete fabrication,
51 including fitting doors for openings and machining for hardware that is not surface applied, before
52 finishing.
53 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted
54 on top and bottom edges, edges of cutouts, and mortises.

- 1
- 2 B. Finish doors at factory.
- 3
- 4 C. Transparent Finish:
- 5 1. Grade: Premium
- 6 2. Finish: AWI conversion varnish system.
- 7 3. Sheen: Satin.
- 8
- 9

10 PART 3 - EXECUTION

11

12 3.01 EXAMINATION

- 13
- 14 A. Examine doors and installed door frames before hanging doors.
- 15 1. Verify that frames comply with indicated requirements for type, size, location, and swing
- 16 characteristics and have been installed with level heads and plumb jambs.
- 17 2. Reject doors with defects.
- 18
- 19 B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 20
- 21 C. Verify that door frames are of type required for door and are installed as required for proper
- 22 installation of doors.
- 23
- 24 D. Do not install doors in frames which would hinder the operation of the doors.
- 25

26 3.02 INSTALLATION

- 27
- 28 A. Do not install in improperly installed frames.
- 29
- 30 B. Hardware: For installation, see Division 08 Section "Door Hardware."
- 31
- 32 C. Installation Instructions: Install doors to comply with manufacturer's written instructions and the
- 33 referenced quality standard, and as indicated.
- 34
- 35 D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- 36
- 37 E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at
- 38 Project site.
- 39
- 40 F. Fit for width by planing. For height, saw, taking not over 1/2 inch first from bottom, then not over
- 41 1/2 inch from top. Bevel lock and hinges edge 1/8 inch in 2 inches.
- 42
- 43 G. Provide 3/32 inch clearance between door and frame and 3/8 inch clearance between bottom of door
- 44 and finish flooring.
- 45
- 46 H. Seal all job site cut surfaces with stain and two coats of varnish.
- 47
- 48 I. Install fire-rated doors in corresponding fire-rated frames in accordance with Wisconsin
- 49 Administrative Code.
- 50

51 3.03 ADJUST AND CLEAN

- 52
- 53 A. Replace or re-hang doors which are hingebound and do not swing or operate properly.
- 54

- 1 B. Refinish or replace job finished doors damaged prior to Substantial Completion.
- 2
- 3

END OF SECTION 08 14 16

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED WORK

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. This section includes the following:

1. Access doors and frames.

- B. Related sections include the following:

1. Division 23 Section "Duct Accessories" for duct access doors.

1.03 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.

1. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following
- a. Method of attaching door frames to surrounding construction.
 - b. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, and special trim.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.

- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-site must meet the limitations and restrictions concerning chemical components set by the following standards:

- 1. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints", Second Edition, January 7, 1997. For applications on ferrous metal substrates.
- 2. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on January 1, 2004.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Access Doors:

- a. Bar-Co, Inc. Div.; Alfab, Inc.
- b. Cesco Products.
- c. J. L. Industries, Inc.
- d. Karp Associates, Inc.
- e. Milcor Limited Partnership.

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed); stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- D. Stainless Steel: Type No. 304 stainless steel with No. 4 satin polish.
- E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.03 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

2.04 ACCESS DOORS AND FRAMES

- A. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Various locations and surfaces, assembly to be manufactured for specific applications.
 - 2. Sizes: 18" x 18" or as shown in drawings.
 - 3. Door: Sheet metal, gauged to door size, minimum 20 gauge metal set flush with surrounding finish surfaces.
 - 4. Frame: To be manufactured specifically for the surrounding material for flush/integral installation, minimum 16 gauge metal flange.
 - a. Drywall bead for gypsum board.
 - b. Fire Rated doors to be place in fire rated assemblies or as noted on drawing.

- 1) All fire rated doors to maintain at least a minimum of the hour rating of the assembly into which it is placed.
- 2) Fire doors shall have automatic closure, be self latching, and contain interior latch release.
- c. Other as needed.
5. Hinges:
- a. Spring-loaded concealed pin type.
6. Latch:
- a. Screwdriver-operated cam latch.
- b. Key operated security lock.

2.05 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
- D. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
- F. All access doors to be fabricated and properly installed in such a manner as to maintain the fire rating of the assembly into which it is placed.
- G. UL listed for use in fire rated partitions if required by the application.

2.06 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.07 METALLIC-COATED STEEL FINISHES

- A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:
1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds,

1 mechanical connections, and abraded areas, and apply galvanizing repair paint specified below
2 to comply with ASTM A 780.

3 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel,
4 complying with SSPC-Paint 20.

5
6 C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and
7 pre-treating.

8
9 D. Stainless Steel: Type No. 304 stainless steel with No. 4 satin polish.

10
11
12 PART 3 - EXECUTION

13
14 3.01 INSTALLATION

15
16 A. Install according to manufacturer's instructions.

17 1. Doors to be installed plumb/level/square as surfaces require.

18 2. Maintain even gap between frame and door.

19
20 B. Stainless steel access panels are to be installed for use in toilets, showers and similar wet areas.

21
22 3.02 ADJUSTING AND CLEANING

23
24 A. Adjust doors and hardware after installation for proper operation.

25
26 B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

27
28 C. Remove all packaging material upon completion.

29
30
31
END OF SECTION 08 31 13

SECTION 08 33 00

COILING DOORS AND GRILLES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- . Coiling Counter Door (Manual)

1.03 SUBMITTALS

- A. Submit in accordance with general conditions of this contract.
1. Shop Drawings.
 2. Manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door.

1.04 QUALITY ASSURANCE

- A. Furnish each coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Package, handle, deliver and store at the job site in a manner that will avoid damage or deformation.

PART 2: PRODUCTS

2.01 COILING COUNTER DOOR-MANUAL

- A. General: Coiling Counter Door: Wayne-Dalton Coiling Wood Counter Doors or approved equal..
1. Mounting: Overhead Structure with:
 - a. Drywall over 16 gauge minimum steel studs or wood stud jambs.
 2. Operation:
 - a. Manual push-up.

2.02 COILING WOOD COUNTER DOORS

- A. Coiling Wood Counter Doors: Wayne Dalton Wood Rolling Counter Shutters.
- B. Curtain:
1. Double rabbeted wood slats 1-3/4 inches high by 1/2 inch thick.
 2. Material:
 - a. White Maple
- C. Guides:
1. Aluminum guides with wool pile lining.

- 1 D. Brackets: Metal plates with permanently sealed ball bearings designed to enclose ends of coil and provide
2 support for counterbalance pipe at each end. Plated fabricated of:
3 1. Steel 3/16 inch thick minimum.
4
5 E. Counterbalance: Curtain is coiled on a pipe of sufficient size to carry door load with a deflection not to exceed
6 0.033 inch per foot of door span and to be correctly balanced by helical springs, oil tempered torsion type. Cast
7 iron barrel plugs are used to anchor springs to tension shaft and pipe.
8
9 F. Hood: Provide intermediate support brackets as required. Hood fabricated of:
10 1. Wood matching slats where exposed. Hook concealed by acoustical ceiling tile, see drawings.
11
12 G. Finish: Clear finish as specified in Section 09 90 00.
13 1. Stainless steel #4 finish.
14
15 H. Locking
16 1. Provide cylinder lock at jambs or in center of bottom bar.
17
18

19 PART 3: EXECUTION

20
21 3.01 EXAMINATION

- 22
23 A. Verify that openings are prepared with headers level, jambs plumb, floor level without projections, and ready to
24 receive rolling door.
25
26 B. Begin installation only when openings conform to specification requirements.
27

28 3.02 INSTALLATION

- 29
30 A. Install per approved shop drawings,
31

32 3.03 ADJUSTING

- 33
34 A. After installation, adjust for proper operation.
35
36

END OF SECTION 08 33 00

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Aluminum Frames.
B. Hardware.
C. Glazing.
D. Accessories for a Complete Installation.

1.03 RELATED WORK

- A. Section 07 92 00, Joint Sealants.
B. Section 08 71 00, Door Hardware: For door hardware to be installed under this section.
C. Section 08 21 00, Wood Doors.
D. Section 08 80 00, Glass and Glazing.
E. Electrical: Division 26 and 28, for electrical connections, conduit and wiring in frames for door hardware.

1.04 QUALITY ASSURANCE

- A. Installer shall be an authorized representative of the door manufacturer for both installation and maintenance of type of units required for this Project.
B. Installer: Not less than 2 year's experience in the installation and service of entrance doors of the same manufacturer.
C. Fenestration must comply with minimum testing performance requirements for an AAMA/NWWDA 101/1.S.2 HC-40 rating. The recognized standard for performance ratings of windows is AAMA/NWWDA 101/1.S.2.
D. Comply with the manufacturers requirements and the following. In case of conflict, comply with the most stringent.
1. NAAMM-Metal Finishes Manual, National Association of Architectural Metal Manufacturers.
2. ASTM B221- Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

3. ASTM B244 – Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instructions.
4. NFPA 80-Fire Doors and Windows.
5. NFPA 252 – Fire Test for Doors Assemblies.
6. UBC Standard 7 – 2 - Fire Test of Doors Assemblies: Positive pressure testing.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract
 1. Manufacturer's product data and standard details for doors, including fabrication, finishing, hardware, accessories and other components of the work. Include roughing-in diagrams, wiring diagrams, parts lists, and maintenance instructions.
 2. Furnish templates, diagrams and other data to fabricators and installers of related work as needed for coordination of installation.
 3. Shop Drawings: Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details.
 4. Samples
 - a. Frame Color: Two 10-inch extrusions with finish, properly labeled.
 - b. Glass: Two 8 x 8 -inch square samples of each glass type indicated, properly labeled.
 - c. Corner of Frame: Sample to include fit, finish and tolerance of frame corner joint.
 5. Owner's Manual: Submitted prior to Substantial Completion. Include recommendations for maintenance, repair.

1.06 INSULATED GLASS, GLAZING, ENTRANCE/STOREFRONT INSTALLATION WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 1. Warranty Period: 10 years from date of Substantial Completion.

1.07 MANUFACTURER/FABRICATOR AND INSTALLER QUALIFICATIONS

- A. Fenestration systems must be fabricated by a firm experienced in production of systems similar to those indicated, whose work has resulted in a record of successful in-service performance during the immediate past three years. The fabricator should have sufficient production capacity to produce required components without causing delays in the work.
- B. Fenestration systems must be installed by an experienced installer, having completed installations of fenestration similar in design and extent to those required for the project whose work has resulted in construction with a record of successful in-service performance during the immediate past three years.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as inside the weatherproofing system and applied on site) must not exceed the following requirements.

- 1 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
2 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
3 date January 7, 2005.
4 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
5 in effect on October 19, 2000.
6
7 B. Recycled Content of Aluminum Materials: Provide aluminum materials containing the maximum
8 possible amount of postconsumer and preconsumer recycled aluminum content.
9
10 C. Recycled Content of Steel Materials: Provide steel materials manufactured domestically using the
11 electric arc furnace method and containing the maximum possible amount of postconsumer and
12 preconsumer recycled steel content.
13
14

15 PART 2 - PRODUCTS

16 2.01 MAUFACTURERS

- 17
18
19 A. Basis-of-Design Product: Subject to compliance with requirements, provide Trifab VG 451 and
20 451T (Exterior conditions) with thermal break by Kawneer North America; an Alcoa company.
21 1. Types of Kawneer Aluminum Storefront Systems include:
22 a. Type 1: Trifab® VG 451T Storefront System – 2" x 4-1/2" nominal dimension;
23 Thermal; Glazing application as indicated on drawings; Stick Fabrication.
24 b. Type 3: Trifab® VG 451 Storefront System – 2" x 4-1/2" nominal dimension; Non-
25 Thermal; Glazing application as indicated on drawings; Stick Fabrication.
26 1) Interior application only.
27
28 B. Or comparable product by one of the following:
29 1. CMI Architectural
30 2. EFCO Corporation.
31 3. TRACO.
32 4. Tubelite.
33 5. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
34 6. YKK AP America Inc.
35

36 2.02 MATERIALS

- 37
38 A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
39 1. Sheet and Plate: ASTM B 209.
40 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
41 3. Extruded Structural Pipe and Tubes: ASTM B 429.
42 4. Structural Profiles: ASTM B 308/B 308M.
43 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
44
45 B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with
46 SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select
47 surface preparation methods according to recommendations in SSPCSP COM and prepare surfaces
48 according to applicable SSPC standard.
49 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
50 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
51 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
52

53 2.03 FRAMING SYSTEMS

54

- 1 A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness
2 required and reinforced as required to support imposed loads.
3 1. Construction: Thermally improved.
4 2. Glazing System: Retained mechanically with gaskets on four sides.
5 3. Glazing Plane: As indicated.
6
7 B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining,
8 nonferrous shims for aligning system components.
9
10 C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding
11 fasteners and accessories compatible with adjacent materials.
12 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal
13 and structural movements, wind loads, or vibration.
14 2. Reinforce members as required to receive fastener threads.
15
16 D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts,
17 complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
18
19 E. Concealed Flashing: [Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing
20 compatible with adjacent materials.
21
22 F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for
23 joint type.
24

25 2.04 GLAZING SYSTEMS

- 26
27 A. Glazing: As specified in Division 08 Section "Glazing."
28
29 B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of
30 profile and hardness required to maintain watertight seal.
31
32 C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
33

34 2.05 ENTRANCE DOOR SYSTEMS

- 35
36 A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
37 1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch thick, extruded
38 aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing
39 brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
40 2. Door Design: As indicated.
41 a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above
42 floor or ground plane.
43 3. Glazing Stops and Gaskets: As specified in Division 08 Section "Glazing".
44
45 B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware" and as below.
46

47 2.06 ENTRANCE DOOR HARDWARE

- 48
49 A. General: Provide entrance door hardware sets indicated in Division 08 Section "Door Hardware".
50
51 B. Weather Stripping: Manufacturer's standard replaceable components.
52 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded
53 PVC.
54 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with
55 nylonfabric or aluminum-strip backing.

- 1
2 C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on
3 mounting strip.
4
5 D. Silencers: BHMA A156.16, Grade 1.
6
7 E. Hardware: See Section 08 71 00 for hardware to be supplied by Section 08 71 00 for installation
8 under this section.
9
10 F. All hardware shall be secured to aluminum door and frame members with a drill-and-tap screw
11 fastener. Stripping of threads or other means of hardware attachment shall be cause for rejection
12 of the entire assembly without additional cost to the Owner.
13
14 G. Weatherstripping Finish: To match door and frame finish unless noted otherwise.
15
16 2.07 ACCESSORY MATERIALS
17
18 A. Two-Piece Extruded Aluminum Head Receptor
19 1. Manufacturer: Traco, a Division of Kawneer, or approved equal.
20 2. Size: to match storefront system
21 3. Color: to match storefront system.
22 4. Installation location: at all storefront runs feet or greater shall have the head receptor.
23
24 B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07
25 Section "Joint Sealants."
26
27 C. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements
28 except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.
29
30 2.08 GLASS
31
32 A. Glass: See Section 08 80 00 for glass to be supplied and installed under this section.
33
34 2.09 GLAZING ACCESSORIES
35
36 A. Glazing Sealant: One-part silicone similar to Pecora 860, Sonneborn Omniplus or Tremco
37 Spectrum 2.
38 1. Comparable means both quality and color options.
39
40 B. Setting Blocks: 70-90 Shore "A" durometer, sized to accommodate size of glass used,
41 compatible with glazing sealant.
42
43 C. Spacers: Compatible with sealant used.
44
45 D. Primer, Sealers, Cleaners: As recommended by glass manufacturer.
46
47 E. Aluminum Stops: Pierced and/or fixed stop, finish to match aluminum framing.
48 1. Equal to Kawneer #069-190, or #169-114 and 069-113.
49
50 2.010 FABRICATION
51
52 A. Form or extrude aluminum shapes before finishing.
53
54 B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of
55 finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- 1
2 C. Framing Members, General: Fabricate components that, when assembled, have the following
3 characteristics:
4 1. Profiles that are sharp, straight, and free of defects or deformations.
5 2. Accurately fitted joints with ends coped or mitered.
6 3. Means to drain water passing joints, condensation within framing members, and moisture
7 migrating within the system to exterior.
8 4. Physical and thermal isolation of glazing from framing members.
9 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain
10 required glazing edge clearances.
11 6. Provisions for field replacement of glazing from [interior].
12 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent
13 possible.
14
15 D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
16
17 E. Storefront Framing: Fabricate components for assembly using shear-block system.
18
19 F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for
20 installing entrance door hardware.
21 1. At exterior doors, provide compression weather stripping at fixed stops.
22 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three
23 silencers on strike jamb of single-door frames and two silencers on head of frames for pairs
24 of doors.
25
26 G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
27 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip
28 and mortised into door edge.
29 2. At exterior doors, provide weather sweeps applied to door bottoms.
30
31 H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent
32 possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
33
34 I. After fabrication, clearly mark components to identify their locations in Project according to Shop
35 Drawings.

36
37 2.011 ALUMINUM FINISHES
38

- 39 A. High-Performance Organic Finish: Factory applied, baked-on, fluoropolymer finish complying with
40 AAMA 2605, 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to
41 exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
42 1. Basis of Design: Permafluor™ Architectural Finishes
43 2. Color: Custom as selected by Architect.
44 3. 70% Fluoropolymer PVDF painted finish.
45

46 PART 3 - EXECUTION

47
48 3.01 EXAMINATION
49

- 50 A. Examine areas and conditions, with Installer present, for compliance with requirements for
51 installation tolerances and other conditions affecting performance of the Work.
52
53 B. Proceed with installation only after unsatisfactory conditions have been corrected.
54

55 3.02 INSTALLATION

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A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Head Receptor

1. Install jamb to jamb.
2. Install as per manufacturer's instructions.

I. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.03 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: [Owner will engage] a qualified independent testing and inspecting agency to perform field tests and inspections.

- 1
2 B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed
3 systems with specified requirements shall take place as follows and in successive phases as indicated
4 on Drawings. Do not proceed with installation of the next area until test results for previously
5 completed areas show compliance with requirements.
6 1. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75
7 feet by 1 story of aluminum-framed systems designated by Architect shall be tested
8 according to AAMA 501.2 and shall not evidence water penetration.
9
10 C. Repair or remove work if test results and inspections indicate that it does not comply with specified
11 requirements.
12
13 D. Additional testing and inspecting, at Contractor's expense, will be performed to determine
14 compliance of replaced or additional work with specified requirements.
15
16 E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
17
18 F. Prepare test and inspection reports.
19
20 3.05 ADJUSTING
21
22 A. Adjust operating entrance door hardware to function smoothly as recommended by
23 manufacturer.
24 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3- second
25 closer sweep period for doors to move from a 70-degree open position to 3 inches from the
26 latch, measured to the leading door edge.
27
28
29

END OF SECTION 08 41 13

SECTION 08 41 26

ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. Section Includes:

1. All-glass interior entrance doors.

- B. Related Sections:

1. Division 5 Section "Metal Fabrications" for overhead-steel support for all-glass systems.

2. Division 8 Section "Glazing" for general glass requirements.

1.03 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.

- B. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

1. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller.

- C. Delegated Design: Design all-glass systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.

- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

- C. Shop Drawings: Show fabrication and installation details, including the following:

1. Plans, elevations, and sections.

2. Details of fittings and glazing, including isometric drawings of rail fittings.

3. Anchoring.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

- 1 1. Metal Finishes: 6-inch- long sections of rail fittings.
2
3 E. Qualification Data: For qualified Installer.
4
5 F. Maintenance Data: For all-glass systems to include in maintenance manuals.
6
7 G. Warranty: Sample of special warranty.
8
9 1.06 QUALITY ASSURANCE
10
11 A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved
12 for installation of units required for this Project.
13
14 B. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based
15 on testing and engineering analysis of manufacturer's standard units in systems similar to those
16 indicated for this Project.
17
18 C. Source Limitations: Obtain all-glass systems from single source from single manufacturer.
19
20 1.07 PROJECT CONDITIONS
21
22 A. Field Measurements: Verify actual locations of walls and other construction contiguous with
23 all-glass systems by field measurements before fabrication and indicate measurements on Shop
24 Drawings.
25
26 1.08 WARRANTY
27
28 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
29 replace components of all-glass systems that do not comply with requirements or that fail in
30 materials or workmanship within specified warranty period.
31 1. Failures include, but are not limited to, the following:
32 a. Structural failures including excessive deflection.
33 b. Deterioration of metals, metal finishes, and other materials beyond normal
34 weathering.
35 c. Failure of operating components.
36
37 2. Warranty Period: Two years from date of Substantial Completion.
38
39
40 PART 2 - PRODUCTS
41
42 2.01 MANUFACTURERS
43
44 A. Basis-of-Design Product: Subject to compliance with requirements, provide Avanti Systems
45 USA Eclipse Glass Pocket Doors or comparable product by one of the following:
46 1. Infinium butt-glazed Quantum.CI Distribution; a division of Vitro America, Inc.
47 2. Alpha Door & Rail, Inc.
48 3. Arch Aluminum & Glass Co., Inc.
49 4. Oldcastle Glass, Inc.
50 5. Virginia Glass Products Corporation; a subsidiary of Virginia Mirror Company.
51 6. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
52 7. Or submit approved equal components and design for a complete installation with
53 Blumcraft or C.R. Lawrence all glass entrance system narrow header and accessories.
54
55 2.02 MATERIALS: ALL GLASS ENTRANCES AND STOREFRONTS

- 1
2 A. Glass: GLT-4A, 3/8" Refer to 08 80 00. Thickness of glass to be verified by manufacturer and
3 installer for configurations indicated in drawings.
4
5 B. Butt Glaze, dry vertical joints. Submit translucent H sections if required for stability.
6
7 C. Head and Sill Channels: Extruded 1" profile, 2-piece glazing channels with brush seals. Finish
8 to be selected from Anodized Aluminum Satin Finish or powder coated steel RAL color selected
9 by Architect from manufacturer's full line. No sill channel at pass thru transaction counters.
10
11 D. Provide end covers, channel end caps and hardware and accessories for complete installation.
12
13 2.03 METAL COMPONENTS
14
15 A. Fitting Configuration:
16 1. Fixed panels with openings as indicated on drawings. Manufacturer to provide
17 acceptable panel opening proportion.
18
19 B. Rail Fittings:
20 1. Material: Aluminum extrusions.
21 a. ASTM B 221, 6063-T6 alloy and temper.
22 2. Height:
23 a. Top Rail: 1-inch height.
24 b. Bottom Rail: 1-inch height.
25
26 3. Profile: Square.
27 4. End Caps: Manufacturer's standard precision-fit end caps for rail fittings.
28 5. Accessory Fittings: Match rail-fitting metal and finish.
29
30 C. Anchors and Fastenings: Concealed.
31
32
33 2.04 DOOR HARDWARE
34
35 A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended
36 by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and
37 finish of rail fittings.
38
39 B. Synchronizing hardware set
40
41 C. Floor guides
42
43 D. Top track
44
45 E. Pull Set: Locking Ladder Pull
46
47 F. Provide all hardware and locking components for a complete installation.
48
49 2.05 FABRICATION
50
51 A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before
52 tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
53 1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when
54 glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.
55

1 B. Factory assemble components and factory install hardware and fittings to greatest extent
2 possible.

3
4 2.06 ACCESSORIES

5
6 A. Glazing Gaskets: ASTM C 864, neoprene or EPDM, or ASTM C 1115, silicone or thermoplastic
7 polyolefin rubber, molded or extruded shape to fit glazing channel retaining slot.

8
9
10 PART 3 - EXECUTION

11
12 3.01 EXAMINATION

13
14 A. Examine areas and conditions, with Installer present, for compliance with requirements for
15 installation tolerances and other conditions affecting performance of the Work.

16
17 B. Proceed with installation only after unsatisfactory conditions have been corrected.

18
19 3.02 INSTALLATION

20
21 A. Install all-glass systems and associated components according to manufacturer's written
22 instructions.

23
24 B. Set units level, plumb, and true to line, with uniform joints.

25
26 C. Maintain uniform clearances between adjacent components.

27
28 D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

29
30 E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

31
32 F. Install joint sealants as specified in Division 7 Section "Joint Sealants".

33
34 3.03 ADJUSTING AND CLEANING

35
36 A. Adjust all-glass entrance doors and hardware to produce tight fit at contact points.

37
38 B. Remove excess sealant and glazing compounds and dirt from surfaces.

39
40 C. Protect installed products until completion of the project.

41
42 D. Clean all framing and glass surfaces after installation.

43
44
45
46

END OF SECTION 08 41 26

SECTION 08 56 19

ALUMINUM PASS-THRU SLIDING SERVICE WINDOW

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Aluminum, heavy-duty commercial sliding service windows as indicated in drawings and in sections.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
- B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
- C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver windows crated to provide protection during transit and job storage
- B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

- A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

- A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

- A. Basis of design: Design is based on Satin Anodized Aluminum Sharyn Custom Frameless Pass-Thru series, Window manufactured by C.R. Laurence Co., Inc. (800) 421-6144 or equal by:
1. Ready-Access, Chicago, IL.

- 1 2. Creative Industries, Indianapolis, IN.
2 3. Nissen & Company, South El Monte, CA.
3
4 2.02 MATERIALS
5
6 A. "No-Hole" Top Hung Clamp-On Roller Assembly
7
8 B. Double Track Header has Side Walls that Hide Roller Assemblies
9
10 C. Finish: Satin Anodized Aluminum
11
12 D. Recessed Bottom Track
13
14 E. Through-glass mounted keyed lock
15
16 F. Soft-close rubber bumpers
17
18 G. Glazing: The glazing is ¼" in thickness. Provide tempered glazing.
19
20 H. Size as indicated on drawings
21
22

23 PART 3 - EXECUTION
24

25 3.01 INSTALLATION
26

- 27 A. Install window in accordance with manufacturer's printed instructions and recommendations.
28

29 3.02 CLEANING
30

- 31 A. Clean frame and glazing surfaces after installation, complying with requirements contained in the
32 manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.
33

34 3.03 PROTECTION
35

- 36 A. Institute protective measures required throughout the remainder of the construction period to ensure
37 that all the windows do not incur any damage or deterioration, other than normal weathering, at the
38 time of acceptance.
39
40
41

END OF SECTION 08 56 19

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Door Hardware.

1.03 RELATED SECTIONS

- A. Finish Carpentry: Section 06 20 00.
- B. Hollow Metal Doors and Frames: Section 08 11 13.
- C. Flush Wood Doors: Section 08 14 16.
- D. Aluminum-Framed Entrances and Storefronts: Section 08 41 13.
- F. Electrical: Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.04 REFERENCES

- A. Federal Specifications (FS)
 - 1. FF-H-106a Hardware, Builders'; Locks and Door Trim-Standard Finishes for Builders Hardware.
- B. National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269.
 - 1. NFPA 80 - Standard for fire doors and windows.
 - 2. NFPA 101 - Code for safety to life from fire in buildings and structures.
- C. Underwriter's Laboratories, Inc. (UL), 333 Pfingsten Road, Northbrook, IL 60062.
 - 1. Building Materials Directory.
- D. Hardware shall be in strict accord with Wisconsin Administrative Code Chapter Comm. 69 - "Barrier Free Design".

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Five (5) copies of a detailed, vertical type hardware schedule for approval.
 - a. List and describe each opening separately. Include doors with identical hardware, except hand, in a single heading. Include door number, room designations, degree of swing, and hand.
 - b. List related details. Include dimensions, door and frame material, and other conditions affecting hardware.
 - c. List all hardware items. Include manufacturer's name, quantity, product name, catalog number, size, finish, attachments, and related details.
 - d. Resubmit four (4) copies of the corrected schedule when required.

- e. Determine keying requirements, as directed by the Owner's Representative and submit five (5) copies of a detailed keying schedule for approval; resubmit four copies (4) of the corrected schedule when required.
 - f. Prior to final payment, provide a record copy of hardware schedules, including all revisions and updates. All openings shall be listed to reflect final installed configuration only.
2. Samples of hardware items as may be required. Identify each sample and indicate the location of subsequent installation in the project.
 3. Provide a copy of the approved hardware schedule and all pertinent templates or template information to each fabricator of material factory-prepared for the installation of hardware.

1.06 QUALITY ASSURANCE

- A. Manufacturers and product numbers listed herein establish a standard of quality. Similar items by other manufacturers may be accepted by prior written approval by the architect in accord with the General Conditions of the Contract. Except where specified in the hardware schedule, furnish products of only one manufacturer for each type of hardware.
- B. Supplier: Hardware Supplier: The hardware supplier shall be a corporate member in good standing of The Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is currently participating in DHI's continuing education program (CEP).
- C. Items of hardware not definitely specified herein but necessary for completion of the Work shall be provided. Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required. Include such nuances as strike type, strike lip, raised barrel hinges, mounting brackets, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.

1.07 REGULATORY REQUIREMENTS

- A. Furnish UL listed hardware for all UL labeled openings in conformance with requirements for the class of opening scheduled.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver hardware to the job site in the manufacturer's original containers marked to correspond with the approved hardware schedule for installation location.
- B. Store hardware in dry surroundings and protect against loss and damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Refer to the Hardware Schedule at the end of this Section.

2.02 ACCESSORIES

- A. Furnish all necessary hardware accessories such as wood or machine screws, bolts, nuts, anchors, toggle bolts, and other fasteners, each of the type, size, material and finish for its intended purpose and each according to the material to which the hardware is being applied.

1 B. Keying system will be determined by the Owner's Representative.
2
3

4 PART 3 - EXECUTION

5
6 3.01 INSTALLATION

- 7
8 A. Install hardware in accordance with manufacturer's recommendations and instructions.
9
10 B. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain
11 the fire rating.
12
13 C. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.
14
15 D. Remove, cover or protect hardware after fitting until paint or other finish is applied. Permanently
16 install hardware after finishing operations are complete.
17
18 E. Install closers on the room side of corridor doors, stair side of stairways, and interior side of exterior
19 doors.
20
21 F. Deliver one complete set of installation and adjustment instructions, and tools with the hardware.
22
23 G. Coordinate security system electrical requirements at doors indicated to have such system.
24
25 H. Coordinate all Owner Furnished Contractor Installed hardware.
26
27 I. Furnish and install temporary keyed-alike cores as required by Architect and Public Works Project
28 Manager to secure the building or portions of the building.
29

30 3.02 ADJUSTING

- 31
32 A. At final completion, adjust and test all hardware for function and performance and leave in good
33 operating condition.
34

35 3.03 CLEANING

- 36
37 A. Clean all hardware to restore the original finish.
38

39 3.04 PROTECTION

- 40
41 A. Protect the finished installation until acceptance of the project.
42

43 3.05 HARDWARE SCHEDULE

- 44
45 A. Manufacturers
46 1. Hinges Hager Hinge Co.
47 a. Approved Equals: McKinney
48 Ives
49
50 2. Lockset Schlage ND Series; Athens Trim Design
51 a. Approved Equals: Falcon T Series; Avalon Trim Design
52 Sargent 10-Line; BL Trim Design
53
54 3. Door Closers LCN 4050 Series
55 a. Approved Equals: Falcon SC 70 Series

- 1 Corbin Russwin DC6000 Series
2
3 4. Kickplate Rockwood Mfg. Co
4 Ives
5 Hager
6
7 5. Electric Strikes Von Duprin
8 a. Approved Equals: HES
9
10 8. Exit devices Von Duprin
11 a. Approved Equals: Falcon
12 Precision
13

14 B. Hardware Sets:

15
16 **SET AL1**

17	1 EA	CONTINUOUS HINGE	780-112HD	CLR	HAGER
18	1 EA	CONTINUOUS HINGE w/EPT	780-112HD w/EPT PREP	CLR	HAGER
19	1 EA	ELECTRIC POWER TRANSFER	EPT-10	628	VON DUPRIN
20	1 EA	SVR EXIT DEVICE	CD9927EO x LBR	626	VON DUPRIN
21	1 EA	SVR EXIT DEVICE	SD-QEL9927NL x LBR	626	VON DUPRIN
22	3 EA	CYLINDER	AS REQUIRED	626	SCHLAGE
23	1 EA	AUTOMATIC OPERATOR	STANLEY MAGIC FORCE	689	STANLEY
24	2 EA	ACTUATOR	AS REQUIRED	689	STANLEY
25	1 EA	CLOSER	4050 SHCUSH	689	LCN
26	1 EA	THRESHOLD	413S	MIL	HAGER

27
28 *CARD READER, POWER SUPPLY, AND WIRING BY OTHERS*
29

30 **SET AL2**

31	1 EA	CONTINUOUS HINGE	780-112HD	CLR	HAGER
32	1 EA	ELECTRIFIED LATCH	4300 x 4600 (INSIDE)	628/626	ADAMS RITE
33	1 EA	CYLINDER	AS REQUIRED	626	SCHLAGE
34	1 EA	CLOSER	4050 x 4050-18	689	LCN
35	1 EA	OVERHEAD STOP	100S	630	GJ
36	1 EA	ELECTRIC STRIKE	6300	630	VON DUPRIN

37
38 *CARD READER, POWER SUPPLY, AND WIRING BY OTHERS*
39

40 **SET AL3**

41	1 EA	CONTINUOUS HINGE	780-112HD	CLR	HAGER
42	1 EA	RIM EXIT	CD99NL	626	VON DUPRIN
43	2 EA	CYLINDER	AS REQUIRED	626	SCHLAGE
44	1 EA	AUTOMATIC OPERATOR	STANLEY MAGIC FORCE	689	STANLEY
45	2 EA	ACTUATOR	AS REQUIRED	689	STANLEY
46	1 EA	THRESHOLD	413S	MIL	HAGER

47
48 **SET 1A**

49	3 EA	HINGES	4.5" x 4.5"	652	HAGER
50	1 EA	OFFICE LOCK	ND53PD	626	SCHLAGE
51	1 EA	WALL STOP	409	630	ROCKWOOD

52
53 **SET 2A**

54	3 EA	HINGES	4.5" x 4.5"	652	HAGER
----	------	--------	-------------	-----	-------

1	1	EA	STOREROOM LOCK	ND80PD	626	SCHLAGE
2	1	EA	CLOSER	4050	689	LCN
3	1	EA	WALL STOP	409	630	ROCKWOOD
4						
5			<u>SET 2B</u>			
6	1	EA	CONTINUOUS HINGE	780-224HD	CLR	HAGER
7	1	EA	EXIT ONLY LOCK	ND25PD	626	SCHLAGE
8	1	EA	CLOSER	4050 SCUSH	689	LCN
9	1	EA	THRESHOLD	410S	MIL	HAGER
10	1	EA	SWEEP	750SN	CLR	HAGER
11	1	SET	SEALS	891SV	MIL	HAGER
12	1	EA	RAIN DRIP	810S	MIL	HAGER
13						
14			<u>SET 3A</u>			
15	3	EA	HINGES	4.5" x 4.5"	652	HAGER
16	1	EA	CLASSROOM LOCK	ND70PD	626	SCHLAGE
17	1	EA	OVERHEAD STOP	100S	630	GJ
18						
19			<u>SET 3B</u>			
20	6	EA	HINGES	4.5" x 4.5"	652	HAGER
21	1	EA	CLASSROOM LOCK	ND70PD	626	SCHLAGE
22	1	EA	MANUAL FLUSH BOLT	555 x 12" (TOP ONLY)	626	ROCKWOOD
23	2	EA	OVERHEAD STOP	100S	630	GJ
24						
25			<u>SET 4A</u>			
26	3	EA	HINGES	4.5" x 4.5"	652	HAGER
27	1	EA	STOREROOM LOCK	ND80PD	626	SCHLAGE
28	1	EA	CLOSER	4050	689	LCN
29	1	EA	WALL STOP	409	630	ROCKWOOD
30	1	EA	ELECTRIC STRIKE	6211	630	VON DUPRIN
31						
32			<i>CARD READER, POWER SUPPLY, AND WIRING BY OTHERS</i>			
33						
34			<u>SET 5A</u>			
35	3	EA	HINGES	4.5" x 4.5"	652	HAGER
36	1	EA	PRIVACY LATCH	ND40S	626	SCHLAGE
37	1	EA	WALL STOP	409	630	ROCKWOOD
38	1	EA	SEALS	726C	CHAR	HAGER
39						
40			<u>SET 6A</u>			
41	3	EA	HINGES	4.5" x 4.5"	652	HAGER
42	1	EA	RIM EXIT	99L-NL	626	VON DUPRIN
43	1	EA	CYLINDER	AS REQUIRED	626	SCHLAGE
44	1	EA	CLOSER	4050	689	LCN
45	1	EA	WALL STOP	409	630	ROCKWOOD
46	1	EA	ELECTRIC STRIKE	6300	630	VON DUPRIN
47						
48			<i>CARD READER, POWER SUPPLY, AND WIRING BY OTHERS</i>			
49						
50			<u>SET 7A</u>			
51	3	EA	HINGES	4.5" x 4.5"	652	HAGER
52	1	EA	RIM EXIT	99L	626	VON DUPRIN
53	1	EA	CLOSER	4050 (180 DEG SWING)	689	LCN
54	1	EA	WALL STOP	409	630	ROCKWOOD

1
2
3

END OF SECTION 08 71 00

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Glass in Steel and Wood Doors
B. Miscellaneous Mirror Glass.
C. Glass in Aluminum-Framed Entrances and Storefronts.
D. Glass in Fire-Rated Framing and Door Systems.

1.03 RELATED WORK

- A. Hollow Metal Doors and Frames: Section 08 11 13.
B. Flush Wood Doors: Section 08 14 16.
C. Aluminum-Framed Entrances and Storefronts: Section 08 41 13.
D. Mirrors in Toilet Room: Section 10 28 00.

1.04 REFERENCES

- A. Reference Specification: "Glazing Manual", by Flat Glass Marketing Association.
B. Materials: Conform in all respects to the "Safety Standard for Architectural Glazing Materials", 16CFR 1201, issued by the Consumer Product Safety Commission.
C. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1. Aluminum Storefront and Entrance Manual.
2. Structural Sealant Glazing Systems (A Design Guide) Aluminum CW Series No. 13.
D. AMA WSG.1 Window Selection Guide.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

- 1 C. Glazing Publications: Comply with published recommendations of glass product manufacturers
2 and organizations below, unless more stringent requirements are indicated. Refer to these
3 publications for glazing terms not otherwise defined in this Section or in referenced standards.
4
- 5 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's
6 "Glazing Manual."
7 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing
8 Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
9
- 10 D. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing
11 with certification label of the SGCC or another certification agency acceptable to authorities
12 having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and
13 safety glazing standard with which glass complies.
14
- 15 E. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with
16 certification label of a testing agency acceptable to authorities having jurisdiction. Label shall
17 indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other
18 openings, whether or not glazing passes hose-stream test, whether or not glazing has a
19 temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
20
- 21 F. All materials used for this project shall be from the same batch run and manufacturer.
22
- 23 G. Water Penetration Resistance, nor uncontrolled water leakage; tested as per ASTM E331
24
- 25 H. Thermal Transmittance Resistance: Maximum "U" factor in accordance with Wisconsin Enrolled
26 Commercial Code; as tested by AAMA 1503.1
27
- 28 I. Condensation Resistance; Condensation Resistance Factor (CRF) to be minimum 56/frame and
29 50/glass, with 30 percent inside relative humidity, and 68 degree F temperature.; as tested by
30 AAMA 1530.1.
31
- 32 J. Sound Transmission Resistance; Sound Transmission Class (STC) for typical application to be
33 minimum of 32; AS tested by ASTM E4134.
34
- 35 K. Fenestration must comply with a minimum testing performance requirements for an
36 AAMA/NWWDA 101/1.S.2 HC-40 rating. The recognized standard for performance ratings of
37 windows is AAMA/NWWDA 101/1.S.2.
38
- 39 L. All performance testing must be conducted by an independent, impartial, third party, AAMA
40 certified testing laboratory.
41
- 42 M. Polyurethane thermal barriers shall be tested as per AAMA TIR A8-90 and AAMA Draft #13 of
43 AAMA's Dry Shrinkage & Composite Performance Thermal Cycling Procedure for validation
44 testing at differential temperatures. At the conclusion of the tests, the shrinkage shall be equal to
45 or less than the prescribed 0.10%.
46
- 47 N. Use of poured and de-bridged polyurethane thermal beak assemblies will require window
48 manufacturer's prior adoption and continued use of the procedures and quality control features
49 outlined in AAMA's Quality Assurance processing guide For Poured and De-bridged
50 Polyurethane Thermal Barriers.
51

52 1.06 PERFORMANCE REQUIREMENTS
53

- 1 A. General: Installed glazing systems shall withstand normal thermal movement and wind and
2 impact loads (where applicable) without failure, including loss or glass breakage attributable to
3 the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to
4 remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
5
- 6 1.07 MIRROR WARRANTY
7
- 8 A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace
9 mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as
10 defects developed from normal use that are not attributed to mirror breakage or to maintaining
11 and cleaning mirrors contrary to manufacturer's written instructions. Defects include
12 discoloration, black spots, and clouding of the silver film.
13 1. Warranty Period: Five years.
14
- 15 1.08 INSULATED GLASS WARRANTY
16
- 17 A. Provide insulating glass manufacturer's written guarantee as per Sections 08 41 13.
18
- 19 1.09 SUBMITTALS
20
- 21 A. Submit in accordance with the General Conditions of the Contract
22 1. Manufacturer's product data.
23 a. Provide data for visible light transmittance, reflectance, U-value, shading
24 coefficient, solar heat gain coefficient and light to solar gain.
25 2. Two samples of each type glass specified.
26
- 27 1.010 DELIVERY, STORAGE AND HANDLING
28
- 29 A. Package, handle, deliver and store to avoid damage. Scratched glass will be rejected.
30
- 31 1.011 PROJECT CONDITIONS
32
- 33 A. Do not proceed with installation of liquid sealants under adverse weather conditions, or when
34 temperatures are below or above manufacturer's recommended limitations for installation.
35
- 36 1.012 ENVIRONMENTAL REQUIREMENTS
37
- 38 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
39 (defined as inside the weatherproofing system and applied on site) must not exceed the following
40 requirements.
41 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
42 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
43 date January 7, 2005.
44 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
45 in effect on October 19, 2000.
46
47
- 48 PART 2 - PRODUCTS
49
- 50 2.01 GLASS PRODUCTS, GENERAL
51
- 52 A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in
53 thicknesses as needed to comply with requirements indicated.
54

- 1 B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float
2 glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements"
3 Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or
4 Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article.
5 Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
6 1. Provide safety glazing labeling.
7
8 C. Thermal and Optical Performance Properties: Provide glass with performance properties
9 specified, as indicated in manufacturer's published test data, based on procedures indicated
10 below:
11 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
12 2. For laminated-glass lites, properties are based on products of construction indicated.
13 3. For insulating-glass units, properties are based on units of thickness indicated for overall
14 unit and for each lite.
15 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's
16 WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
17 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values,
18 according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
19 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
20

21 2.02 GLASS PRODUCTS

- 22
23 A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class 1 (clear) unless otherwise indicated.
24
25 B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise
26 indicated; of kind and condition indicated.
27 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion
28 parallel to bottom edge of glass as installed unless otherwise indicated and free of tong
29 marks.
30 2. For uncoated glass, comply with requirements for Condition A.
31 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
32 4. Comply with requirements for safety glass in the International Building Code.
33
34 C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.
35

36 2.03 SILVERED FLAT GLASS MIRRORS

- 37
38 A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror
39 coating process.
40
41 B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with
42 ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
43
44 C. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for
45 use in protecting against silver deterioration at mirrored glass edges.
46
47 D. Mirror Edge Treatment: Flat polished.
48 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or
49 atmospheric penetration of glass coating.
50

51 2.04 INSULATING GLASS

- 52
53 A. Glass Type GL-13: Low-e-coated, tinted insulating glass PPG Industries, Inc.; Solar Control, Low-
54 E, Solarban 60:

- 1 1. Overall Unit Thickness: 1 inch.
- 2 2. Thickness of Each Glass Lite: 6.0 mm.
- 3 3. Outdoor Lite: Tinted float glass, heat-strengthened float glass or fully tempered float glass as
- 4 required by conditions and codes.
- 5 a. Outdoor lite: Clear
- 6
- 7 4. Interspace Content: Air.
- 8 5. Indoor Lite: Clear float glass, heat-strengthened float glass or fully tempered float glass as
- 9 required by conditions and codes.
- 10 a. Solarban 60 Low-E Coating: Sputtered on third surface.
- 11
- 12 6. Visible Light Transmittance: 70 percent minimum.
- 13 7. Winter Nighttime U-Factor: 0.29 maximum.
- 14 8. Summer Daytime U-Factor: 0.27 maximum.
- 15 9. Solar Heat Gain Coefficient: 0.39 maximum.
- 16 10. Shading Coefficient: 0.45
- 17 11. Outdoor Visible Light Reflectance: 11 percent.
- 18 12. Provide safety glazing labeling.
- 19 13. Glass: Clear float/tempered.
- 20
- 21 B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a
- 22 dehydrated interspace, qualified according to ASTM E 2190, and complying with other
- 23 requirements specified.
- 24 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
- 25 2. Spacer: Manufacturer's standard spacer material and construction.
- 26 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- 27 4. Dehydrated Interspace Content: Air.
- 28 5. Thickness: 1 inch typical; provide 5/8 inch thick unit at storefront entrance.
- 29
- 30 2.05 FIRE-PROTECTION-RATED GLAZING
- 31
- 32 A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to
- 33 authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to
- 34 NFPA 252 for door assemblies and NFPA 257 for window assemblies.
- 35 1. Manufacturers: Subject to compliance with requirements, products from manufacturers that
- 36 may be incorporated into the Work include, but are not limited to, the following:
- 37 a. AGC InterEdge Technologies
- 38 b. Nippon Electric Glass Co (TGP)
- 39 c. Oldcastle
- 40 d. Pilkington
- 41 e. Safti First
- 42 f. Schott
- 43 g. Vetrotech Saint-Gobain
- 44
- 45 2.06 GLASS TYPE SCHEDULE
- 46
- 47 A. Glass Products indicated below are based on proprietary products of Viracon, PPG, SAFTI FIRST
- 48 Serious Materials and Bendheim. Products from any of the above listed manufacturers that meet the
- 49 design criteria of the glass specified below are acceptable.
- 50 1. GLT 1: Clear float glass.
- 51 a. Thickness: 1/4".
- 52
- 53 2. GLT 2: Tempered glass mirror.
- 54 a. Thickness: 4.0mm.

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- 3. GLT 4: Tempered, clear float glass.
 - a. Thickness: 1/4".
- 4. GLT 4A: Tempered, clear float glass.
 - a. Thickness: 3/8".
- 5. GLT 13: Refer to above.

2.07 GLAZING ACCESSORIES

- A. Glazing Sealant: One-part silicone similar to Pecora 860, Sonneborn Omnipus or Tremco Spectrum 2.
 - 1. Comparable means both quality and color options.
- B. Setting Blocks: 70-90 Shore "A" durometer, sized to accommodate size of glass used, compatible with glazing sealant.
- C. Spacers: Compatible with sealant used.
- D. Primer, Sealers, Cleaners for Fire-Rated Glazing: As recommended by fire-rated glazing manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Check that glazing channels are free of burrs, irregularities, and debris.
- B. Check that glass is free of edge damage or face imperfections.
- C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

- A. Field Measurement
 - 1. Measure size of frame to receive glass.
 - 2. Compute actual glass size, allowing for edge clearances.
- B. Preparation of Surfaces
 - 1. Remove protective coatings from surfaces to be glazed.
 - 2. Clean glass and glazing surfaces to remove dust, oil and contaminants.

3.03 INSTALLATION

- A. Install glass in accordance with glass manufacturer's recommended instructions.
- B. Provide weathertight installation.
- C. Fire-rated glazing insulated glazing units shall be glazed into the appropriate fire-rated framing with an approved glazing compound (polysulfide sealant or closed cell PVC tape) as supplied by the installer.

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SECTION 09 29 00

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Gypsum Board and Gypsum Board Assemblies (Metal Studs)
B. Cementitious Backer Board.
C. Acoustical Batt Insulation.
D. Trim and Accessories.

1.03 RELATED WORK

- A. Section 06 10 00, Rough Carpentry
B. Section 09 90 00, Painting

1.04 REFERENCES

- A. Referenced Specifications: The more stringent requirement of this section or referenced specification applies.
1. "Using Gypsum Board for Walls and Ceilings", The Gypsum Association - GA-201-85.
2. "Recommended Specifications for the Application and Finishing Gypsum Boards", The Gypsum Association - GA-216.
B. Fire Rated Assemblies: Provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL, or tested in accordance with ASTM E119 for type of construction shown.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Manufacturer's product data including acoustic sealant.
2. Texture finish sample.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site with manufacturer's labels intact and legible.
B. Handle materials with care to prevent damage.
C. Deliver fire-rated material bearing testing agency label and required fire classification numbers.
D. Storage

- 1 1. Store materials inside under cover, stack flat, off floor.
- 2 2. Stack wallboard so that long lengths are not over short lengths.
- 3 3. Avoid overloading floor system.
- 4 4. Store adhesives in dry area, provide protection against freezing at all times.

5
6 1.07 PROJECT CONDITIONS

- 7
- 8 A. During cold weather, maintain temperature range between 55 degrees F. to 70 degrees F. for 24
- 9 hours before, during, and after gypsum board and joint treatment applications.
- 10
- 11 B. Ventilation
- 12 1. Provide ventilation during and following adhesive and joint treatment applications.
- 13 2. Use temporary air circulators in enclosed areas lacking natural ventilation.
- 14 3. Protect installed materials from drafts during hot, dry weather.
- 15
- 16

17 PART 2 - PRODUCTS

18
19 2.01 MANUFACTURERS

- 20
- 21 A. Georgia Pacific.
- 22
- 23 B. LaFarge.
- 24
- 25 C. National Gypsum Company.
- 26
- 27 D. United States Gypsum Company.
- 28
- 29 E. Dietrich Industries.
- 30
- 31 F. Chicago Metallic.
- 32
- 33 G. Certainteed Gypsum
- 34
- 35 H. American Gypsum
- 36
- 37 I. Reef Industries
- 38
- 39 J. Fry Reglet Architectural Metals
- 40
- 41 K. Or approved equal.
- 42

43 2.02 MATERIALS

- 44
- 45 A. Gypsum Board: ASTM C 36, long edges tapered; in lengths as long as practical to keep number of
- 46 end joints to absolute minimum.
- 47 1. Regular Gypsum Board.
- 48 2. Abuse-resistant Gypsum Board: USG Fiberock AR.
- 49 3. Water Resistant Wallboard: 5/8-inch thick.
- 50 4. Fire Code Board: Type "X" or Fire code "C".
- 51 5. Embedded Glass Reinforced Gypsum Sheathing. 1/4" or as shown on drawings.
- 52 a. Certainteed "ProRoc 14" Flex" or approved equal.

- 1 6. Cementitious Backer Board: Aggregated, Portland cement board with woven, glass fiber,
2 mesh facing; complying with ANSI A118.9.
- 3 a. Manufacturer: USG, Durock Interior Tile Backer Board.
- 4 b. Thickness: 1/2 inch or 5/8 inch as shown on drawings.
- 5 7. Or approved equal.
- 6
- 7 B. Metal Studs/Resilient Furring Channels.
- 8 1. Unless indicated otherwise, use 25-gage for partitions up to 12'-0" high, use 20-gage for
9 partitions over 12'-0" high.
- 10 2. Unless indicated otherwise, use 20-gage studs at door jambs, head.
- 11 3. Track gauge shall be same gauge as nested studs.
- 12 4. All exterior non-structural metal framing, including but not limited to Z furring and studs
13 shall be 16 ga. Galvanized.
- 14
- 15 C. Compressible U-shaped fire rated track at fire rated walls as indicated on drawings.
- 16 1. CEMCO Fire Management Products (FAS Track)
- 17 a. 25 gauge minimum ceiling runner, 3 inch legs minimum with 1-1/2 inch slots.
- 18 b. 1-1/4 inch intumescent strip affixed to the top of both legs.
- 19 2. Or approved equal.
- 20
- 21 D. Suspension System
- 22 1. Chicago Metallic 640 system.
- 23 a. Hanger Wire: 8-gage, annealed.
- 24 b. Carrying Channels: 1-1/2 inch cold rolled steel.
- 25 c. Screws: USG 1-inch type S.
- 26 d. Furring Channels: USG metal furring channel, attached with USG furring channel
27 clips.
- 28
- 29 2. Chicago Metallic 650 System, complying with UL Design No. D502.
- 30 a. Hanger clips: 18 gauge galvanized steel.
- 31 b. Hanger wire: No. 12 SWG galvanized steel.
- 32 c. Carrying Channels: 16 gauge 1 1/2 inch cold rolled.
- 33 d. Furring Cross Channel: 16 gauge 7/8 inch where required.
- 34 e. Wall Molding: 26 gauge steel channel 1 11/16 inch deep with 15/16 inch flanges.
- 35 3. Or approved equal.
- 36
- 37 E. Accessories
- 38 1. Edge Trim Armstrong, Axiom One-Piece Drywall Trim, 2.5" straight, or approved equal.
- 39 2. Metal Trim: USG No. 200-A or approved equal.
- 40 3. L-shaped Metal Trim USG No. 801-B.
- 41 4. Metal Reveal Molding: Fry Reglet DRM-625-75.
- 42 5. Metal Reveal Molding: Fry Reglet DRM-625-200.
- 43 6. Metal 'Z' Reveal Molding, 1/4" wide: Fry Reglet DRMZ-625-25.
- 44 7. Metal "Z" Reveal Molding, 1/2" deep X 1/2" wide: Fry Reglet DRMZ-50-50
- 45 8. Metal 'Z' Reveal Molding 5/8" wide X 1/2" deep Fry-Reglet DRMZ- 625-50.
- 46 9. Metal 'Z' Reveal Molding, 1" wide: Fry Reglet DRMZ-100-100.
- 47 10. Metal "Z" Reveal Molding 2" wide: Fry Reglet DRMZ-625-200
- 48 11. Expansion Joints: USG No. 093.
- 49 12. Drywall Screws for Metal Framing: 1" Type S-12 or Type S bugle head.
- 50 13. Outside Corner Reinforcement: USG No. 104, 1-1/8" x 1-1/8" corner bead.
- 51 14. Acoustical Sealant: Equal to Tremco "Tremflex 834" or Pecora "Acoustic and Insulation
52 Sealant", low VOC formulation.
- 53 a. VOC content less than 50 g/l.

- 1 15. Sound Attenuation Blanket: U.S. Gypsum Thermafiber, 3” for an STC of 49
2 16. Or approved equals.

3
4 F. Drywall Finishing Accessories

- 5 1. Joint Compounds: Ready mixed type, or approved equal.
6 2. Joint Reinforcement: USG Perf-A-Tape, or approved equal.

7
8 G. Texture Finish Materials

- 9 1. Ceilings: USG Spray Fine Sand Texture Finish, or approved equal.
10 2. Walls (Painted Only): “Orange Peel”.

11
12
13 PART 3 - EXECUTION

14
15 3.01 METAL STUDS

- 16
17 A. Attach metal runners at floor and at ceiling or structural elements above with suitable fasteners
18 located 2 inches from each end, spaced 16 inches on center.
19
20 B. Position studs vertically, engaging floor and ceiling runners. Splice studs with 8-inch nested lap,
21 one positive attachment per stud flange. Place studs in direct contact with all door frame jambs,
22 abutting partitions, partition corners, existing construction elements.
23
24 C. Anchor studs adjacent to door frames, partition intersections, and corners to ceiling and floor runner
25 flanges with USG metal lock fastener tool.
26
27 D. Provide double studs at jambs and head of each door frame. Securely anchor studs to jamb and head
28 anchor clips at metal door frames by bolt or screw attachment. Over metal frames, place a
29 cut-to-length section of runner horizontally with web-flange bent at each end; secure with one
30 positive attachment per flange. Position a cut-to length stud (extend to ceiling runner) at vertical
31 board joints over door frame header. Place an additional track-to-track stud 6 inches from double
32 jamb studs on both sides of framed openings.
33
34 E. At curved surfaces, space studs and framing members 8 inches on center maximum.

35
36 3.02 GYPSUM BOARD

- 37
38 A. Follow Gypsum Association's recommendations for installation procedures.
39
40 B. Cut wallboards by scoring and breaking or sawing; scribe neatly at wall projections.
41
42 C. Apply first to ceilings then to walls.
43
44 D. Maintain a 5/8” space between floor and bottom edge of gypsum board.
45
46 E. Locate wallboard joints at openings so that no end joint aligns with edge of opening.
47
48 F. Set fasteners with heads slightly below surface of wallboard. Avoid breaking face paper.
49
50 G. Provide water resistant wallboard at rooms/areas with high humidity.

51
52 3.03 CEMENTITIOUS BACKER BOARD

- 1 A. Cementitious Backer Board Installation:
2 1. Use as backing for all ceramic wall tile.
3 2. Install as indicated to comply with ANSI A108.11 and in accordance with manufacturer's
4 instructions.
5 3. Complete plumbing rough-in before boards are erected.
6 4. Separate board from rough-in and fixtures and fill space as recommended by manufacturer.
7 5. Securely fasten boards to substrate as required.
8 6. Follow manufacturer's instructions for treatment of edge terminations.
9 7. At joints and corners, embed fiberglass tape in skim coat of mortar.
10
11 B. Cementitious Backer Board Joints: Prepare and finish joints in accordance with manufacturer's
12 instructions.
13
14 3.04 CEILING SUSPENSION SYSTEM
15
16 A. Suspend carrying channels with 8-gage hanger wires spaced 48 inches on center, within 6 inches of
17 ends.
18
19 B. Install carrying channels 48 inches on center and within 6 inches of walls. Provide 1 inch clearance
20 between channel ends and abutting walls, partitions.
21
22 C. At splices, interlock flanges, overlap ends 12 inches, and secure with 16-gage double standard tie
23 wire at each end.
24
25 D. Erect furring channels at right angles to carrying channels, spaced 24 inches on center and within 6
26 inches of walls. Provide 1-inch clearance between channel ends and abutting walls, partitions.
27
28 E. Secure to carrying channels with clips, or, saddle tie with 16-gage double standard tie wire. At
29 splices nest channels at least 8 inches, securely wire tie at each end.
30
31 F. Install additional cross reinforcing to restore lateral stability of suspension system at openings that
32 interrupt carrying or furring channels.
33
34 G. Apply wallboard of maximum practical length with long dimension at right angles to furring
35 channels. Position and stagger end joints over channel web. Fit ends and edges closely, but not
36 forced together.
37
38 H. Fasten board to channels with 1-inch Type S screws spaced 12 inches on center in field of board,
39 along abutting ends, edges.
40
41 I. Comply with UL Design No. D502 requirements at fire rated assembly.
42
43 3.05 EXPANSION JOINTS
44
45 A. At Ceilings: 50'-0" on center each way maximum.
46
47 B. At Walls: 30'-0" on center maximum.
48
49 C. Provide continuous from each door jamb to top of partition.
50
51 D. Provide at intersections with exposed masonry construction.
52
53 3.06 SINGLE LAYER/ERECTION

- 1
2 A. Position all ends, edges over framing members, except when edge joints are at right angles to
3 framing members, or when end joints are back-blocked. Apply wallboard horizontally or vertically
4 on walls to minimize the number of joints.
5
6 B. Attach wallboard to metal framing supports by power driven screws. For vertical application space
7 screws 12 inches on center in field of board, 8 inches on center staggered along vertical abutting
8 edges. For horizontal application space screws 12 inches on center in field, along abutting end
9 joints.
10
11 3.07 MULTI-LAYER WALLBOARD ERECTION
12
13 A. Base Layer: Erected as specified for "Single Layer Erection".
14
15 B. Joints in face layer to fall at least 10 inches from parallel joints in base layer.
16
17 C. Apply face layers with adhesive in accordance with wallboard manufacturer's printed instructions.
18 Provide sufficient number and spacing of fasteners to hold top layer tight with bottom layer until
19 adhesive dries.
20
21 3.08 JOINT TREATMENT APPLICATION
22
23 A. Mix joint compound in accordance with manufacturer's recommendations.
24
25 B. Apply compound in thin uniform layer to all joints, angles to be reinforced. Apply reinforcing tape
26 centered over joint, seated into compound. Follow immediately with thin skim coat or embed tape.
27 Fold and embed tape in interior angles to provide true angle.
28
29 C. When embedding coat is thoroughly dry, apply second coat of compound, filling board taper flush
30 with surface. Cover tape, feather out slightly beyond tape.
31
32 D. On joints with no taper, cover tape, feather out at least 10 inches on either side of tape.
33
34 E. When second coat is thoroughly dry, spread finish coat evenly over and extend slightly beyond
35 second coat. Feather to a smooth, uniform finish.
36
37 F. Over taped edges, do not allow finish coat to protrude beyond plane of surface. Apply finish coat to
38 cover tape, taping compound at taped angles to provide true angle. When necessary, sand between
39 coats and follow with final coat to provide level 4 smooth surface ready for decoration except in
40 locations noted in section 09 26 13 Gypsum Veneer Plastering.
41
42 G. Do not abrade adjacent face-paper surfaces.
43
44 3.09 FINISHING FASTENERS
45
46 A. Apply compound to fastener depressions. Follow with minimum of two additional coats leaving
47 depressions level with surface.
48
49 B. Do not abrade adjacent face-paper surfaces.
50
51 3.010 FINISHING BEAD AND TRIM
52
53 A. Mechanically fasten outside corner reinforcement per manufacturer's instructions.

- 1
2 B. Apply first coat to beads, trim. Properly feather out from ground to plane of surface. Embed flanges
3 of corner reinforcement with compound.
4
5 C. When embedding coat is thoroughly dry, apply second coat in same manner as first-coat, extending
6 compound slightly beyond onto face of board.
7
8 D. When second coat is thoroughly dry, apply finish coat extending compound slightly beyond second
9 coat, properly feathering from ground to plane of surface. Sand finish coat as necessary to provide a
10 level 4 flat smooth surface, ready for decoration.
11
12 E. Do not abrade adjacent face-paper surfaces.
13
14 3.011 ACOUSTIC SEALANT
15
16 A. Apply sealant at intersections of wallboard and adjacent materials to form a complete seal to air and
17 noise.
18
19 3.012 TEXTURE FINISH
20
21 A. Apply texture finish in accord with manufacturer's printed instructions.
22
23 B. Provide uniform texture over entire surface.
24
25 3.013 ADJUST AND CLEAN
26
27 A. Ridging
28 1. Sand ridges to reinforcing tape without cutting through tape.
29 2. Fill concave areas on both sides of ridge with topping compound.
30 3. After fill is dry, blend in topping compound over repaired area.
31
32 B. Fill cracks with compound and finish smooth and flush.
33
34
- END OF SECTION 09 29 00

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SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Wall Tile

- B. Floor Tile

- C. Base Tile

- D. Transition Strips

1.03 RELATED WORK

- A. Gypsum Board: Section 09 29 00, for tile Cementitious backer board.

1.04 REFERENCES

- A. The following specifications and standards are incorporated by reference:
1. Tile Council of America, Inc. - "Handbook for Ceramic Tile Installation".

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Samples for colors on 12 inch by 12 inch panels in duplicate for tile specified.
2. Samples in duplicate for each different trim piece required.
3. Grout samples in duplicate indicating color range anticipated, texture.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, handle, deliver and store at the job site in original unbroken containers in a manner that will avoid damage or contamination.
B. All containers shall bear grade seals, manufacturer's name, size, color and quantities.

1.07 PROJECT CONDITIONS

- A. Set and grout tile when ambient temperature is at least 50 degrees F. and rising.

PART 2 - PRODUCTS

2.01 TILE

- A. Wall tile.
1. WT-1: Porcelain Tile, O.F.C.I.

- 1 a. Fiandre, TN505M124
- 2 b. Color: Riviera Beige
- 3 c. Sizes: 12"x24"
- 4 d. Installation: As per drawings
- 5
- 6 2. WT-2: Glazed Ceramic Tile, O.F.C.I.
- 7 a. Dal-Tile, Mosaic, 64207
- 8 b. Color: D017 Red
- 9 c. Size: 1-inch tile in 12"x24" sheet
- 10 d. Installation: As per drawings.
- 11

12 B. Floor tile.

- 13 1. FT-1: Porcelain Tile, O.F.C.I.
- 14 a. Fiandre, TN505M124
- 15 b. Color: Riviera Beige
- 16 c. Sizes: 12"x24"
- 17 d. Installation: Running Bond
- 18

19 C. Base tile.

- 20 1. BT-1: Porcelain Tile, O.F.C.I.
- 21 a. Fiandre, TN505M124
- 22 b. Color: Riviera Beige
- 23 c. Sizes: 12"x24". Contractor to cut to a 6-inch base
- 24 d. Installation: Running Bond
- 25

26 2.02 SETTING MATERIALS

27

28 A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

- 29 1. Prepackaged dry-mortar mix containing dry, re-dispersible, ethylene vinyl acetate additive to which
- 30 only water must be added at Project site.
- 31 2. Prepackaged dry-mortar mix combined with acrylic resin liquid-latex additive.
- 32 a. For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 in
- 33 addition to the other requirements in ANSI A118.4.
- 34

35 2.03 ACCESSORIES

36

37 A. Portland Cement: ASTM C 150, type 1.

38

39 B. Sand: ASTM C-144.

40

41 C. Water: Clean and potable.

42

43 D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces,

44 specifically approved for materials and installations indicated by tile and grout manufacturers.

45

46 E. Grout:

- 47
- 48 1. Non-sanded (Selected as per tile manufacturer's recommendation)
- 49 a. Color: To be selected by AE from manufacturer's full range of colors.
- 50
- 51 2. Sanded (Selected as per tile manufacturer's recommendation)
- 52 a. LATICRETE "Tri-Poly Fortified Sanded Grout (1500 Series)"; Bostik Findley "Hydroment
- 53 Ceramic Tile Grout (sanded)"; or approved equal.
- 54 b. Color: To be selected by AE from manufacturer's full range of colors.

- 1) Acrylic Additive: LATICRETE “1776 Grout Admix Plus”; Chargar Corporation “Acryl 60” or approved equal.
- F. Acrylic Additive: LATICRETE “1776 Grout Admix Plus”; Chargar Corporation “Acryl 60” or approved equal.
- G. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- H. Provide other materials not specifically described but required for a complete and proper installation.
- I. Transition Strips:
1. Ceramic Tile to carpet
 - a. Manufacturer: Schluter
 - b. Profile: Either Schluter-Schiene or Schluter-Deco, based on the final carpet selection
 - c. Material: Stainless steel
 - d. Size according to materials used with approval of A/E.
 2. Ceramic Tile to Concrete
 - a. Manufacturer: Schluter
 - b. Profile: Schluter –Reno Ramp-K
 - c. Material: Stainless steel
 - d. Size according to materials used with approval of A/E.
 3. Ceramic Tile to VCT
 - a. Manufacturer: Schluter
 - b. Profile: Schluter –Reno-U,
 - c. Material: Stainless steel
 - d. Size according to materials used with approval of A/E.
 4. Or approved equal.
- J. Sealer
1. Product: Dupont Stonetech Professional Heavy Duty Grout Sealer
- PART 3 - EXECUTION
- 3.01 EXAMINATION
- A. Examine surfaces where tile is to be applied and notify the Contractor of any defects.
- 3.02 INSTALLATION
- A. General
1. Installation and workmanship shall be in accordance with ANSI A108.1 and as specified herein. The printed instructions of the tile manufacturer and the manufacturer of proprietary mortars and grouts shall be followed where applicable.
 2. Before commencing work, establish field pattern and border line locations.
 3. Center the work symmetrically so that no tile need be cut to less than half size.
 4. Joints in wall tile shall be aligned vertically and horizontally; staggered joints will not be accepted.
 5. Align joints when adjoining tiles on floor, base and trim are the same size.
 6. Rub exposed edges smooth.

- 1 B. Interior Wall Tile Setting Bed: TCA W202/Tile backer board substrates - acrylic modified latex-cement
2 mortar.
- 3
- 4 C. Handle, store, mix and apply proprietary setting and grouting materials in compliance with the manufacturer's
5 instructions.
- 6
- 7 D. Extend tile work into recesses and under equipment and fixtures to form a complete covering without
8 interruptions, except as otherwise shown.
- 9
- 10 E. Terminate work neatly at obstructions, edges, and corners without disruption of pattern or joint alignments.
- 11
- 12 F. Comply with manufacturer's instructions for mixing and installation of proprietary materials.
- 13
- 14 G. Neutralize and seal substrates in accordance with setting bed manufacturer's instructions, where required.
- 15
- 16 H. Jointing Pattern: Grid pattern.
- 17
- 18 I. Expansion, Control Joints
- 19 1. Extend completely through tile mortar bed. Insert preformed back-up material to provide correct
20 cavity depth for sealant.
- 21 2. Width of expansion, control joints: Same as tile joints.
- 22 3. Prior to grouting, keep expansion and control joints open and clean.
- 23 4. After tile is grouted and completely dry, remove temporary filler material. Brush joints clean, fill
24 expansion and control joints.
- 25
- 26 J. Seal as per manufacturers requirements.
- 27
- 28 3.03 CLEANING
- 29
- 30 A. After completion, clean all work, point open joints and replace defective work.
- 31
- 32 3.04 PROTECTION
- 33
- 34 A. Close off work spaces to traffic during installation and at least 48 hours after completion of work.
- 35
- 36 B. Tiled vertical outside corners shall be protected with board corner strips in areas used as passageways.
- 37
- 38
- 39 END OF SECTION 09 30 00
- 40

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Acoustical Board.
B. Suspension Systems.

1.03 RELATED WORK

- A. Acoustical Treatment 09 84 13 (Acoustic Wood Systems)
B. Mechanical (Air Supply and Return Devices): Division 23.
C. Electrical (Light Fixtures): Division 26.

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
1. Manufacturer's product specifications and installation instructions for each acoustical ceiling material and suspension system required, including certified laboratory test reports.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size and thickness as applicable, legible and intact.
B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
C. Store cartons open at each end to stabilize moisture content and temperature.

1.06 PROJECT CONDITIONS

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof. Complete installation of damp materials before beginning work.
B. Maintain humidity of 65 - 75 percent in areas where acoustical materials are to be installed 24 hours before, during, and after installation.
C. Maintain a uniform temperature in the range of 55 to 70 degrees F. prior to and during installation of materials.

1.07 EXTRA MATERIALS

- A. Deliver extra materials equal to a minimum of 2% of each type of acoustical material supplied.

- 1 B. All cartons shall be new, unopened, packaged with protective covering for storage, and identified
2 with appropriate labels.
3

4 1.08 ENVIRONMENTAL REQUIREMENTS
5

- 6 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
7 (defined as inside the weatherproofing system and applied on site) must not exceed the following
8 requirements.

9 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
10 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date
11 January 7, 2005.

12 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
13 in effect on October 19, 2000.
14

- 15 B. Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and agrifiber
16 products used inside the weatherproofing system shall contain no added urea-formaldehyde resins.

17 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
18 agrifiber assemblies shall contain no added urea-formaldehyde resins.
19
20

21 PART 2 - PRODUCTS
22

23 2.01 CEILING TILE
24

- 25 A. ACT-1:

26 1. Armstrong Optima 3251, White acoustical fine textured tile, 9/16" square tegular edge

27 a. Material: Fiberglass with DuraBrite®.

28 b. Surface Finish: DuraBrite with acoustically transparent membrane. Color: White

29 c. Dimensions: 24x24x1"

30 d. UL Classified Noise Reduction Coefficient (NRC) 0.95

31 e. Ceiling Attenuation Class (CAC): NA

32 f. Light Reflection Coefficient: 0.86.

33 g. Anti-mold, mildew and sag resistant.

34 h. Warranty: 30-year limited system warranty against visible sag, mold/mildew and
35 bacterial growth.

36 a. Suspension System 1

37 2. Or approved equal.
38

- 39 B. ACT-2:

40 1. Armstrong Clean Room™ VL, 868

41 a. Material: Wet-formed mineral fiber.

42 b. Surface Finish: Vinyl-faced membrane. Color: White

43 c. Dimensions: 24x24x5/8"

44 d. Ceiling Attenuation Class (CAC) 40

45 e. Light Reflection Coefficient: 0.80.

46 f. Anti-mold, mildew and sag resistant.

47 g. Scrubbable.

48 h. Impact resistant, scratch resistant and soil resistant.

49 i. Low VOC

50 j. Warranty: 30-year limited system warranty against visible sag, mold/mildew and
51 bacterial growth.

52 a. Suspension System 2

53 2. Or approved equal.
54
55

1 2.02 CEILING GRID

2
3 A. Suspension System 1: Used with ACT-1: Armstrong Optima 3251 only

- 4 1. The suspension system shall be Armstrong Interlude®, Sonata® or Silhouette® (1/8" or 1/4"
5 slot), 9/16".
6 a. or 9/16" intermediate-duty or heavy-duty equal from the following:
7 a) Chicago Metallic.
8 b) National Rolling Mills.
9 c) Donn/USG.
10
11 2. Installed using not less than 12-gauge galvanized steel hanger wire.
12 3. Suspension system installation shall conform to ASTM C636.
13 4. Components: All main beams and cross tees shall be commercial quality hot-dipped
14 galvanized per ASTM A653. Main beams and cross tees are double-web steel construction
15 with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-
16 finished galvanized steel in baked polyester paint. Main beams and cross tees shall have
17 rotary stitching.
18 5. Structural Classification: ASTM C635 Intermediate Duty.
19 6. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
20 7. Accessories:
21 a. Provide all clips and stabilizing bars required per manufacturer's instructions
22 for proper installation.
23

24 B. Suspension System 2: Used with ACT-2: Armstrong Clean Room™ VL, 868 only.

- 25 1. Product: Armstrong Clean Room™ Aluminum Grid System, 15/16".
26 a. Components: All main beams and cross tees shall be commercial quality co-
27 extruded aluminum. All surfaces are PVC.
28 b. Main beams and cross tees have exposed flange design with hold down clips.
29 c. Structural Classification: ASTM C 635 Intermediate Duty.
30 d. Color: White and match the actual color of the selected ceiling tile, unless
31 noted otherwise.
32
33 2. Other acceptable Manufacturers that may have a Product that meets the specification:
34 a. Chicago Metallic.
35 b. National Rolling Mills.
36 c. Donn/USG.
37 d. Or approved equal.
38

39 C. Armstrong Axiom: Transition Trims

- 40 a. Components:
41 a. Trim Channel: Aluminum
42 b. Corner Options:
43 c. Bottom Drywall Trim (for 5/8" drywall):
44 d. Alignment Clip:
45 e. T-Bar Connection Clip:
46 f. Splice Plate.
47
48

49 PART 3 - . EXECUTION

50
51 3.01 EXAMINATION

- 52
53 A. Examine surfaces scheduled to receive suspended or directly attached acoustical units for
54 unevenness, irregularities, and dampness that would affect quality and execution of work. Do not
55 proceed with work until unsatisfactory conditions have been corrected.

- 1
2 3.02 INSTALLATION
3
4 A. Do not begin installation until sufficient materials to complete a room are received.
5
6 B. Install materials in accordance with manufacturer's printed instructions, governing regulations, fire
7 resistance rating requirements, and industry standards applicable to work.
8 1. Install wind clips at all areas subject to movement due to wind or rapid pressure changes or
9 as shown on drawings.
10
11 C. Measure each ceiling area and establish layout of acoustical units to balance border widths at
12 opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with
13 reflected ceiling plans wherever possible.
14 1. Or as shown in on drawings.
15
16 D. Symmetrically locate grid layout in each space. Coordinate work with other trades so that lighting
17 fixtures, grilles, and other ceiling fixtures work with grid layout.
18
19 E. Do not use universal splices or other splices which would obstruct passage of recessed lighting
20 fixtures through grid openings or limit fixture relocation upon flanges of ceiling grids.
21
22 F. Support suspension system from structure above, not from ductwork, metal deck, equipment or
23 piping.
24
25 G. Space hangers not more than 6 inches from ends and not more than 4 feet on center.
26
27 H. Install edge moldings at the perimeter of each acoustical ceiling area and at locations where edge of
28 units would otherwise be exposed.
29 1. Secure moldings to building construction by fastening with screw anchors into the
30 substrate, through holes drilled in vertical leg. Space holes not more than 3 inches from
31 each end and not more than 16 inches on center along each molding.
32 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8 inch in 12 feet.
33 3. Miter corners of moldings accurately to provide hairline joints, securely connected to
34 prevent dislocation. Cope exposed flanges of intersecting suspension system members, so
35 that flange faces will be flush.
36 4. Furnish additional tees for supporting grilles, diffusers and light fixtures. Refer to the
37 reflected ceiling, HVAC and electrical plans for locations.
38 5. Provide tegular edge at walls, other abutting vertical surfaces, at all tegular tile board types.
39 6. Field paint cut edges to surface color and sheen.
40
41 I. Arrange acoustical units and orient directionally-patterned units, if any, in manner shown on
42 reflected ceiling plans.
43
44 J. Install wood plank suspension system and panels in compliance with ASTM C636, with the
45 authorities having jurisdiction, and in accordance with the manufacturer's shop drawings and
46 installation instructions.
47
48 3.03 CLEANING
49
50 A. Clean exposed surfaces of acoustical ceilings, trim, edge moldings, and suspension members to
51 comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
52
53 B. Remove work which cannot be successfully cleaned and repaired to permanently eliminate evidence
54 of damage.
55

- 1 3.04 PROTECTION
2
3 A. Provide required protection for the acoustical ceilings, including temperature, humidity limitations
4 and dust control so that the work will be without damage and deterioration at the time of acceptance
5 by the Owner.
6
7

8 END OF SECTION 09 51 00

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SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Resilient Base.
B. Resilient Flooring.
C. Accessories.
D. Subfloor Preparation.

1.03 RELATED WORK

- A. Selective Structure Demolition: Section 02 41 19.
B. Carpet (vinyl and metal reducers): Section 09 68 00.

1.04 QUALITY ASSURANCE

- A. Provide each type of resilient flooring and accessories from a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
B. Installers Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.
C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials.
1. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Manufacturer's technical data for each type of resilient flooring and accessory.
a. Data indicating adhesive and accessories meet VOC requirements.
2. Manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.
3. Submit samples of metal edge strips.
4. Two copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1 1.06 DELIVERY, STORAGE AND HANDLING
2

- 3 A. Deliver materials to project site in manufacturer's original, unopened containers with labels
4 indicating brand names, colors and patterns, and quality designations legible and intact.
5
6 B. Store and protect materials in accordance with manufacturer's recommendations.
7

8 1.07 PROJECT CONDITIONS
9

- 10 A. Maintain minimum temperature of 65 degrees F and maximum temperature of 90 degrees F in spaces
11 to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not
12 less than 48 hours after installation. Subsequently, maintain minimum temperature of 55 degrees F
13 in areas where work is completed.
14
15 B. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before
16 beginning installation.
17
18 C. Install resilient flooring and accessories after other finishing operations, including painting, have
19 been completed.
20
21 D. Do not install resilient flooring over concrete slabs until they have been cured and are sufficiently
22 dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended
23 bond and moisture test.
24
25 E. Close areas to traffic and to other work until flooring is firmly set. Tile shall have 72 hours with no
26 traffic.
27
28 F. Where solvent based adhesives are used, provide safety sparkproof fans when natural ventilation is
29 not adequate.
30

31 1.08 WARRANTY
32

- 33 A. Provide current, detailed manufacturer's warranty for each flooring product as applicable including
34 limited wear, defect and conductivity.
35
36 B. Provide manufacturer's standard one-year warranty against defects in manufacturing and
37 workmanship of resilient flooring products. Provide manufacturer's standard limited wear
38 warranty/conductivity warranty as specified under each product as applicable.
39

40 1.09 EXTRA MATERIALS
41

- 42 A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as
43 materials installed and enclosed in protective packaging with appropriate identifying labels.
44 1. Furnish one box for each type, color, pattern and size installed.
45

46 1.010 ENVIRONMENTAL REQUIREMENTS

- 47 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
48 (defined as inside the weatherproofing system and applied on site) must not exceed the following
49 requirements.
50 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
51 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
52 2005.

- 1 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
2 effect on October 19, 2000.

3
4
5 PART 2 - PRODUCTS

6
7 2.01 RESILIENT FLOOR

- 8 A. Shaw Hard Surface® is used as the basis of design. Armstrong, or approved equal.

9
10 B. RF-1 Product:

- 11 1. Style Name/Number: Grain + Pigment
12 2. Color: to be selected from manufacturer's full range. See installation pattern note below.
13 3. Construction: High Performance Luxury Vinyl Tile.
14 4. Direct glue down
15 5. Overall Thickness: 2.5mm.
16 6. 20 mil wear layer.
17 7. Nominal Dimensions: 7"x48"
18 8. 10 year limited commercial wear warranty and 10 year under bed warranty.
19 9. Class III printed film vinyl plank
20 10. Added antimicrobial: Flor Sept™
21 11. Finish: ExoGuard™
22 12. Backing Class: Commercial Grade.
23 13. Slip Resistance/ASTM D2047: >0.65 (wet/dry).
24 14. Static Load Limit/(Modified ASTM F970: 1500 psi.
25 15. Passes ASTM F1914 Residual Indentation <8%
26 16. Passes ASTM F137 Flexibility
27 17. Passes ASTM G21 0: Fungi free.
28 18. Passes ASTM F 1514 Resistance to Heat.
29 19. Passes ASTM F 1515 Resistance to Light.
30 20. Passes ASTM F 925 Resistance to Chemicals.
31 21. Passes ASTM 648, Radiant Flux, > 0.45 watts/cm² NFPA Class 1
32 22. Passes ASTM E662, Smoke Density, < 450.

- 33
34 C. Installation pattern to be provided by Architect with a pattern containing (3) materials/colors in
35 rooms: Resource Center 205, Office 210, Workarea 212, Flexible Employment and Training 220,
36 Conference 200 and Family Multi-Purpose Overflow 217. All other rooms to receive (1)
37 material/color.

38
39 2.02 RESILIENT WALL BASE

- 40
41 A. General: Rubber, cove base, top set, roll stock.

- 42 1. Height: 4" where required to match existing adjacent base.
43 2. Colors: to be selected by architect by manufacturer's full range

44
45 3.

- 46
47 B. Manufacturers: Armstrong (colors to be selected from manufacturers' full range) or approved equal
48 by:

- 49 1. Flexco.
50 2. Freudenberg Building Systems, Nora.
51 3. Johnsonite.
52 4. Roppe.

1 2.03 ACCESSORIES
2

- 3 A. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material
4 and substrate conditions; equal to HENRY GreenLine GL33High-Performance VCT Adhesive, low
5 VOC type.
6
7 B. Resilient tile flooring adhesive Basis of Design: Shaw 4100 or S150
8 a. VOC content: <0.5 grams/liter
9 b. Refer to manufacturer's installation instructions
10
11 C. Adhesive for Wall Base: W.W. Henry "595 Cove Base Adhesive", zero-VOCs; W.F. Taylor "2035
12 Cove Base Adhesive" or "2040 Premium Cove Base Adhesive", GreenGuard certified; PL
13 Adhesives & Sealants "Cove Base Adhesive"; Bostik Findley, Durabond "D-740 Multipurpose Wall
14 Adhesive".
15 1. Low-VOC type: VOC content less than 100 g/l.
16
17 D. Concrete Slab Primer: Non-staining, low-VOC type, equal to W.F. Taylor Co. "Envirotec
18 Healthguard" #2006, as approved by flooring and underlayment manufacturers.
19
20 E. Patching, Leveling, Underlayments: The leveling materials must be portland cement based and
21 provide a minimum 3,500 PSI compressive strength (ASTM C 109) and sufficient bond to existing
22 subfloor surface.
23 1. Ardex, Laticrete, Duralox, Mapei, or equivalent, approved by flooring manufacturer.
24
25 F. Metal Edge Strip: Similar to Ceramic Tile Company CTC1132CTA.
26
27

28 PART 3 - EXECUTION
29

30 3.01 EXAMINATION
31

- 32 A. The subfloor must be prepped to meet meets the requirements as described in the manufacturer's installation
33 instructions.
34 1. Rough up smooth epoxy surfaces to accommodate resilient flooring manufacturer's installation
35 requirements.
36
37 B. A clean non-burnished concrete surface free from any paint, wax, oil, grease, and film forming curing
38 compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds is required. The
39 surface should not have any alkaline salts, laitance, mold, mildew, residual adhesive, chemical adhesive
40 removers or anything that may prevent appropriate products bonding to it. If not then the general contractor
41 should provide the mechanical means to remove them. This could be dustless diamond grinding (DiamaBrush),
42 bead-blast or similar with a suitable HEPA vacuum attachment. Review and comply with all relevant local, state
43 and federal regulations.
44
45 C. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the
46 manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard
47 expansion joint assembly.
48
49 D. When required, use a leveler following the manufacturers written instructions. The surface should be free of
50 dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that
51 may interfere with the bond. These should be completely removed by mechanical means only. Dustless

1 diamond grinding or bead blasting are the preferred method to remove contaminants and bond breakers, as it
2 also helps to level the concrete.

- 3
4 E. Perform mat bond tests in each major area (1 per ~1,000 sq. ft.) This should consist of the proposed
5 subfloor preparation, mitigation and leveling or smoothing products. Do not proceed with installation until
6 all the results of the bond test are acceptable.
7
8 F. Prime the subfloor prior to using a suitable leveler, as approved by the resilient flooring manufacturer.
9
10 G. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only
11 use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a
12 residue that may interfere with the adhesive bond.
13
14 H. Perform moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to
15 ascertain presence of curing compound. Do not use curing compounds on concrete subfloors.
16
17 I. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory. Indicate adverse
18 conditions of any type by letter.
19

20 3.02 PREPARATION

- 21
22 A. Comply with ASTM F 710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring,
23 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient
24 flooring adhesive by method acceptable to manufacturer.
25
26 1. Concrete floors with steel troweled (slick) finish shall be properly roughened (sanded) to ensure
27 suitable adhesion.
28 2. Concrete floors with curing, hardening and/or breaking compounds shall be abraded with mechanical
29 methods only to remove compounds.
30 a. Do not use chemicals for removal.
31 b. Do not use wax or oil based sweeping compounds.
32
33 B. Sand or grind subfloors to remove mortar, paint, other surface irregularities.
34
35 C. Where filling, patching, leveling is required of thickness exceeding 1/8-inch apply latex type underlayment in
36 two or more applications. Apply compound in accordance with manufacturer's printed instructions.
37
38 D. Remove all debris, sand, and other materials which would result in lack of adhesion and/or star cracking.
39

40 3.03 INSTALLATION

- 41
42 A. Areas of the flooring that are subject to direct sunlight through doors or windows should have them covered
43 using blinds, curtains, cardboard or similar for the time of the installation and 72 hours after the installation to
44 allow the adhesive to cure. Note: These areas should be installed using wet adhesives only.
45
46 B. Install resilient flooring, including but not limited to the following, in accordance with the manufacturer's
47 installation instructions.
48 1. Do not mix manufacturing batches of a color within the same area.
49 2. Do not install resilient flooring over building expansion joints.
50 3. Do not install defective or damaged resilient flooring.
51 4. Layout resilient flooring to provide ~equal size at perimeter. Adjust layout as necessary to reduce the
52 amount of resilient flooring which is cut to less than half full width.
53 5. Lay resilient flooring with arrows in the same direction (excluding borders).

6. Install resilient flooring without voids at seams. Lay seams together without stress.
7. Cut/scribe resilient flooring neatly at perimeter and obstructions.
8. Extend resilient flooring into reveals, closets, and similar openings.
9. Remove excess adhesive immediately.

C. Install reducer strips at exposed edges.

D. Prevent all traffic for a minimum of 12 hours and rolling loads for 72 hours to allow the adhesive to cure. If required, after 12 hours protect the flooring from damage during construction operations using Masonite, plywood or a similar product, ensuring first that the flooring surface is free of all debris. Lay panels so that the edges form a butt joint and tape the joint to prevent both movement and debris entrapment underneath them. Inspect immediately before covering and after removal for final acceptance.

3.04 WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.

B. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Cut no shorter than full wall length.

C. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
2. Adhesive shall cover a minimum of 90 percent of ribbed back of base.
3. Leave 1/4 inch uncovered space at top edge of base to prevent oozing.
4. Roll base firmly, roll back toward starting point.

3.05 CLEANING

A. Perform following operations immediately upon completion of resilient flooring.

1. Have the flooring cleaned no sooner than 72 hours after the installation using the method approved by the manufacturer's maintenance recommendations.
2. Touch-up and repair any minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

3.06 PROTECTION

A. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

END OF SECTION 09 65 00

SECTION 09 68 00

CARPET

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. Standard Commercial Carpet.
B. Transition Strips.
C. Floor Filler.
D. Adhesives.

1.03 RELATED WORK

- A. Related Sections include the following:
1. Section 09 65 00: "Resilient Flooring" for resilient wall base installed with carpet.

1.04 REFERENCES

- A. Carpet shall be in strict accord with Wisconsin Enrolled Commercial Building Code, Chapter 11 - "Accessibility".
B. Carpet and Rug Institute (CRI).

1.05 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, fade resistance and printed statement of VOC content.
B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: 12-inch square, (2) Samples.
2. Exposed Edge, Transition, and other Accessory Stripping: 6-inch long, (2) Samples.
C. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.
D. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

1
2 A. Installer Qualifications: An experienced installer who is certified by the Floor Covering
3 Installation Board or who can demonstrate compliance with its certification program
4 requirements.

5
6 1.07 DELIVERY, STORAGE, AND HANDLING

7
8 A. Comply with CRI 104, Section 5, "Storage and Handling."

9
10 1.08 PROJECT CONDITIONS

11
12 A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and
13 Section 7.12, "Ventilation."

14
15 B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry,
16 and ambient temperature and humidity conditions are maintained at the levels indicated for
17 Project when occupied for its intended use.

18
19 C. Floors must be free of dust, oils, grease, or other foreign matter.

20
21 D. Allow installation to cure for a minimum of 24 hours before subjecting it to any traffic, moving
22 of furniture, or other heavy equipment.

23
24 1.09 WARRANTY

25
26 A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to
27 repair or replace components of carpet installation that fail in materials or workmanship within
28 specified warranty period.

29 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure
30 of substrate, vandalism, or abuse.

31 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge
32 raveling, snags, runs, and delamination.

33 3. Warranty Period: Lifetime.

34
35 1.010 EXTRA MATERIALS

36
37 A. Furnish extra materials described below, before installation begins, that match products installed
38 and that are packaged with protective covering for storage and identified with labels describing
39 contents.

40 1. Carpet: Full-sized Tiles equal to 5 percent of amount installed for each type indicated,
41 but not less than 10 sq. yd.

42
43
44 PART 2 - PRODUCTS

45
46 2.01 STANDARD COMMERCIAL CARPET TILES

47 A. Products: Subject to compliance with requirements, provide one of the following:

48 1. Carpet, CPT-1 Option:

49 a. Carpet Tile

50 1) Manufacturer: Shaw Contract Group

51 2) Collection: Unearthed

52 3) Style: Jasper, 5T016

53 4) Color: As selected from Manufacturer's fill line

- 1 5) Backing: Ecoworx® Tile
2
3 2. Carpet, CPT-2:
4 a. Carpet Tile
5 1) Manufacturer: Shaw Contract Group
6 2) Collection: Unearthed
7 3) Style: Jasper, 5T016
8 4) Color: As selected from Manufacturer's fill line
9 5) Backing: Ecoworx® Tile
10

11 B. Characteristics: All carpet shall be same mill run throughout.
12

13 2.02 INSTALLATION ACCESSORIES
14

15 A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based
16 formulation provided or recommended by carpet manufacturer.
17

18 B. Adhesives: Water-resistant, mildew-resistant, non-staining pressure sensitive type to suit
19 products and subfloor conditions indicated, that complies with flammability requirements for
20 installed carpet and is recommended or provided by carpet manufacturer.

- 21 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content
22 when calculated according to 40CFR 59, Subpart D (EPA Method 24).
23

24 C. Transition Strip:

- 25 1. Carpet to Concrete

- 26 a. Johnsonite CTA-XX-J.
27 b. Color as selected by Architect from manufacturer's full line.
28

- 29 2. Carpet to Resilient

- 30 a. Johnsonite CTA-XX-A.
31 b. Color as selected by Architect from manufacturer's full line.
32
33

34 PART 3 - EXECUTION
35

36 3.01 EXAMINATION
37

38 A. Examine substrates, areas, and conditions, with Installer present, for compliance with
39 requirements for maximum moisture content, alkalinity range, installation tolerances, and other
40 conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential
41 defects.
42

43 B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

- 44 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other
45 materials that may interfere with adhesive bond.
46 a. Determine adhesion and dryness characteristics by performing bond and moisture
47 tests recommended by carpet manufacturer.
48 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
49

50 C. Proceed with installation only after unsatisfactory conditions have been corrected.
51

52 3.02 PREPARATION
53

- 1 A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with
2 carpet manufacturer's written installation instructions for preparing substrates.
3
4 B. Use trowelable leveling and patching compounds, according to manufacturer's written
5 instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks,
6 holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more
7 stringent requirements are required by manufacturer's written instructions.
8
9 C. Remove coatings, including curing compounds, and other substances that are incompatible with
10 adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical
11 methods recommended in writing by carpet manufacturer.
12
13 D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

14
15 3.03 INSTALLATION

- 16
17 A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the
18 following:
19 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down
20 Installation."
21
22 B. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the
23 door in closed position.
24 1. It door openings install adapters/transitions/reducers to be covered by door when in the
25 closed position.
26 2. Level adjoining border edges.
27
28 C. Do not bridge building expansion joints with carpet.
29
30 D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture
31 including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as
32 recommended by carpet manufacturer.
33
34 E. Install metal transition strip with anchoring leg under carpet where carpet abuts resilient terrazzo
35 tile.
36 1. Secure metal transition strip to substrate according to manufacturer's instructions.
37
38 F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable
39 flanges, alcoves, and similar openings.
40
41 G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by
42 repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking
43 device.
44
45 H. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned
46 Carpet Installations" and with carpet manufacturer's written recommendations.
47
48 I. All selvages shall be trimmed to ensure good side seams. All seams shall receive an 1/8"
49 continuous bead of seam adhesive at the point the face yarn enters the back.
50 1. Fit edges together with an invisible seam and bond with appropriate adhesive.

51
52 3.04 CLEANING AND PROTECTING
53

- 1 A. Perform the following operations immediately after installing carpet:
2 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner
3 recommended by carpet manufacturer.
4 2. Remove yarns that protrude from carpet surface.
5 3. Vacuum carpet using commercial machine with face-beater element.
6
7 B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
8
9 C. Protect carpet against damage from construction operations and placement of equipment and
10 fixtures during the remainder of construction period. Use protection methods indicated or
11 recommended in writing by carpet manufacturer and carpet adhesive manufacturer.
12
13

14

END OF SECTION 09 68 00

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SECTION 09 84 13

ACOUSTICAL TREATMENT

PART 1:GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Acoustical Ceiling Panels.
B. Installation Accessories.

1.03 RELATED WORK

- A. Gypsum Board, Section 09 29 00 for Acoustic Insulation and furring.
B. Acoustical Ceilings 09 51 00.

1.04 REFERNECES

- A. Reference Standards: Conform to all governing laws, building codes, and the following performance criteria:
1. Fire Performance Characteristics: acoustic planks with surface burning characteristics as determined by testing panel components in accordance with ASTM E84 test procedures. ASTM E 84 testing must be performed by an independent testing organization acceptable to authorities having jurisdiction.
 2. Panels will be finished with Fire retardant clear lacquer. ASTM E-84 Classification, Class "A" Flame Spread: 25 or less Smoke Developed:450 or less
 3. Acoustical Performance Characteristics: Provide acoustic planks with acoustical absorption characteristics which have been determined by testing fully assembled production material (using 96-112kg/cu.m. (6 - 7lb/cu.ft.) density fiber glass insulation) in accordance with ASTM C 423 (Type A and F25 mounting method as defined by ASTM E-795) by a testing organization acceptable to authorities having jurisdiction.

1.05 SUBMITTALS

- A. Submit in accordance with T General Conditions of the Contract.
1. Product Data: Manufacturer's catalog information edited to indicate specific products and related accessories to be provided for this Project.
 2. Maintenance Data: Recommended procedures for normal cleaning and removal of stains. Include precautions in use of cleaning materials that may be detrimental to surfaces.

1.06 QUALITY ASSURANCE

- A. Manufacturer & Installer: Firm manufacturing the specified product shall have adequate capacity required for projects listed and have successfully completed similar projects for a period of not less than five years. The Installer should be approved by the manufacturer as qualified to perform work required.

1 1.07 DELIVERY, STORAGE AND HANDLING

- 2
3 A. Protect products against damage during delivery and handling.
4
5 B. Store all items in a clean, dry storage area.
6
7 C. Maintain temperature in storage area above 40 degrees F. without excessive humidity.
8

9 1.08 PROJECT CONDITIONS

- 10
11 A. Install under same temperature, humidity conditions that will normally exist when building is occupied.
12
13 B. Maintain temperature of all areas to receive acoustical wall treatment at 70 degrees F. for 72 hours before,
14 during and 48 hours after application.
15
16 C. Remove material from packaging and allow to acclimatize in area of installation 24 hours before
17 application.
18

19 1.09 GUARANTEE

- 20
21 A. Furnish to the Owner, the manufacturers written guarantee covering the products supplied against defects
22 in materials and workmanship under normal operating conditions for a period of one year from the date of
23 shipment. Submit certificates of compliance showing warranty period by dates for each project completed
24 to the Owner.
25
26

27 PART 2:PRODUCTS

28
29 A. MATERIALS

30 1. Acoustic Panels: AP-1

- 31 a. Decoustics SOLO 8 Acoustic Planks
32 i. Description: Decoustics SOLO 8 “No added formaldehyde” Acoustic PLANKS,
33 as manufactured by:
34 Decoustics Limited
35 61 Royal Group Crescent
36 Woodbridge, Ontario
37 Canada, L4H 1X9
38
39 b. Furnish and deliver Decoustics SOLO 8 “No added formaldehyde” Acoustic planks as
40 described in this section for installation in areas as shown on drawings meeting or
41 exceeding the following requirements:
42 i. Decoustics Solo 8 acoustic planks shall be comprised of a single piece
43 “no added formaldehyde” MDF core of 16mm (5/8”) thickness faced
44 with a real wood veneer. The structure is perforated by means of “V”
45 routing on 8mm (5/16”) centers and intersecting perforations of 8mm
46 (5/16”) diameter on staggered 16mm (5/8”) centers.
47 ii. Veneer to be: Maple, clear matte Finish lacquered to match Architects
48 sample.
49 iii. Unless otherwise specified, veneer will be quarter cut, slip matched.
50 Veneer will not be sequenced. Clear lacquer finish to 30% sheen.
51 iv. Provide solid trim/edge as indicated on drawings.
52
53 c. Solo planks of 192mm (7 9/16”) shall be installed by installed by means of
54 Decoustics supplied clips and a tongue and groove connection on hardwood

blocking or metal furring. Solo 8 plank clips must be located at a maximum of 600mm (23 5/8”) on center. If necessary, formaldehyde free acoustically absorptive material of adequate thickness required to meet the acoustic absorption requirements shall be installed between furring or horizontal wood blocking prior to panel installation. The Solo 8 planks shall be supplied with a black facing on the back side to prevent fiber glass insulation color from “reading” through, and shall be site fabricated to sizes required and neatly fitted to adjacent materials. Trim perimeter as detailed. Installer shall provide for shimming and adjustment as required to maintain consistent alignment of joints and of finished panel faces.

- d. Solo 8 “no added formaldehyde” Acoustic Planks shall have noise reduction coefficient values of the following:

Description	Thickness	Frequency (Hz)							NRC	SAA
		125	250	500	1000	2000	4000			
Solo 8-25*	1 5/8 (41mm)	0.1	0.45	1.03	0.96	0.51	0.51	0.75	0.73	
Solo 8-50*	2 5/8 (67mm)	0.36	0.97	1.15	0.92	0.7	0.69	0.95	0.95	
Solo 8**5/8 (16mm)		0.09	0.12	0.37	0.82	0.68	0.40	0.50	0.50	

* Type A Mounting (with 1” (Solo 8-25), or 2” (Solo 8-50) fiber glass backer)

** Type F25 Mounting (1” (25mm) furring/airspace - no backer)

- a. Or approved equal product of the following manufacturers:
 - i. Armstrong
 - ii. Capaul
 - v. Panel Solutions, Inc.
 - vi. Quiet Solutions by Acoustic Associates.
 - vii. AGCI (Architectural Wood Components Group, Inc.)

2. AP-2

- a. AGCI Linear Open Series 2
- b. Species to match AP-1
- c. Class “A” Fire Retardant Particle Board
- d. 8’ and/or 10’ length
- e. Black non –woven felt 3/4” reveals
- f. 3/4” thick x 3 1/4” width.
- g. Suspension clips and heavy duty 15/16” T-bar grid. Coordinate suspension requirements.
- h. Or approved equal.

2.04 ACCESSORY PRODUCTS

- A. Splines/Clips: Aluminum, designed for concealed use, all types required for starts and intermediate fastening.

PART 3:EXECUTION

3.01 INSTALLATION

- A. See that substrate is acceptable for the successful completion of the work of this Section prior to starting work.
- B. Conform to manufacturer's installation details. All fastening devices shall be concealed in completed installation. Wall panels shall be securely affixed by means of splines/clips attached vertically to smooth wall or furring strips. Splines shall engage vertical kerfs on the

1 edges of the wall panels. Apply adhesive where necessary, blocking where necessary. Field
2 cut edges shall be covered by means of on-site fabric wrapping.

3
4 C. Prior to final inspection and/or occupancy of the building by the Owner, review installation
5 and replace all damaged panels, leaving installation complete and ready for occupancy by the
6 Owner without further work.

7
8
9

END OF SECTION 09 84 13

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Painting and finishing of interior and exterior exposed items and surfaces throughout Project.
- B. Refinishing of existing surfaces as indicated on Drawings, including removal of paint and finishes, preparation, painting and finishing.
- C. Field painting of exposed bare and covered pipes and ducts and hangers, conduits, uni-strut, exposed steel and iron work, all metal fabricated Section 05 50 00 items, and primed metal surfaces including but not limited to, hollow metal work, equipment installed under mechanical and electrical work.
- D. "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied material whether used as prime, intermediate or finish coats.
- E. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.
- F. Following categories are not included as part of field-applied finish work.
1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified.
 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces in concealed areas and generally inaccessible areas.
 3. Finished Metal Surfaces.
 4. Operating Parts.

1.03 RELATED WORK

- A. Section 03 36 02, Special Concrete Floor Finishes for sealing of exposed concrete floors.
- B. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
- C. Examine the Contract Documents and be familiar with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other Sections shall be painted or finished as part of this Section.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract:

- 1 1. Paint: Submit a list of specified products with corresponding name of manufacturer,
2 identifying name and number of proposed products along with manufacturer's written
3 instructions for use of each product.
- 4
- 5 2. If manufacturer to be used is different from that of color chips furnished, prepare and
6 submit two approximately 6 inch square, properly labeled samples of each color and
7 sheen required on properly prepared paint-out cards or hardboard.
- 8
- 9 3. Stain: Two, 6 inch square properly labeled samples of each color and sheen required on
10 actual wood for project.
- 11
- 12 4. Prepare and repaint an area of each designated interior surface to requirements specified
13 herein, with specified paint or coating showing selected color, gloss/sheen, texture and
14 workmanship to MPI Repainting Manual standards for review and approval by Owner and
15 A/E. When approved, interior surface shall become acceptable standard of finish quality and
16 workmanship for similar on-site repainting work.
- 17

18 1.05 QUALITY ASSURANCE

19

20 A. MPI Standards:

- 21 1. Products: Complying with MPI standards indicated and listed in "MPI Approved
22 Products List."
- 23
- 24 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural
25 Painting Specification Manual" for products and paint systems indicated.
 - 26 a. For areas to be renovated, comply with requirements in "MPI Maintenance
27 Repainting Manual".
- 28

29 1.06 DELIVERY, STORAGE AND HANDLING

- 30
- 31 A. Do not deliver materials to site until having received all written approvals of submitted
32 information and samples.
- 33
- 34 B. Deliver materials to job site in original, new and unopened packages and containers bearing
35 manufacturer's name and label.
- 36
- 37 C. Store materials not in actual use in tightly covered containers.
- 38
- 39 D. Take all precautions to ensure that workers and work areas are adequately protected from fire
40 hazards and health hazards resulting from handling, mixing and application of paints.
- 41
- 42 E. Remove rags and waste from storage areas daily.
- 43

44 1.07 PROJECT CONDITIONS

- 45
- 46 A. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air
47 temperatures are between 50 and 95 degrees F.
- 48
- 49 B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding
50 air temperatures are between 45 degrees F. and 95 degrees F.
- 51
- 52 C. Do not apply paint when relative humidity exceeds 85%; at temperatures less than 5 degrees F.
53 above the dew point; or to damp or wet surfaces.
- 54

- 1 1.08 SEQUENCING AND SCHEDULING
2
3 A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto
4 newly-painted surfaces.
5
6 1.09 EXTRA MATERIALS
7
8 A. Furnish extra materials described below that are from same production run (batch mix) as
9 materials applied and that are packaged for storage and identified with labels describing
10 contents.
11
12 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and
13 color applied.
14
15 1.010 ENVIRONMENTAL REQUIREMENTS
16
17 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied
18 on-site must meet the limitations and restrictions concerning chemical components set by the
19 following standards:
20 1. Topcoat Paints, Green Seal Standard GS-11, Paints: First Edition, May 20, 1993.
21 2. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive
22 Paints", Second Edition, January 7, 1997. For applications on ferrous metal substrates.
23 3. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
24 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
25 January 1, 2004.
26
27
28 PART 2 - PRODUCTS
29
30 2.01 MANUFACTURERS
31
32 A. Provide products from the following manufacturers:
33
34 1. AFM Safecoat
35
36 2. Benjamin Moore & Co.
37
38 3. Cabot
39
40 4. ICI/Dulux.
41
42 5. Mythic Paint, Southern Diversified Products
43
44 6. PPG Architectural Finishes, Inc.
45
46 7. Rymar, LLC
47
48 8. Sherwin-Williams Company
49
50 9. Sikkens
51
52 10. Target Coatings
53
54 11. Diamond Vogel Paint

- 1
2 2.02 MATERIALS
3
4 A. Use the materials of the same manufacturer for each system.
5
6 B. Sherwin-Williams systems are called out in the system schedules to establish quality and dry mil
7 thickness of finished installation for all systems. A different manufacturer may be used for color
8 selection. Any manufacturer noted above may be used as long as quality and color requirements
9 are met.
10
11 1. Proprietary names used to designate colors or materials are not intended to imply that
12 products of named manufacturers are required to exclusion of equivalent products of
13 other manufacturers.
14
15 C. Provide best quality grade of various types of coatings as regularly manufactured by acceptable
16 paint materials manufacturers.
17
18 D. Material Compatibility:
19
20 1. Provide materials for use within each paint system that are compatible with one another
21 and substrates indicated, under conditions of service and application as demonstrated by
22 manufacturer, based on testing and field experience.
23
24 2. For each coat in a paint system, provide products recommended in writing by
25 manufacturers of topcoat for use in paint system and on substrate indicated.
26
27 E. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that
28 comply with the following limits for VOC content, exclusive of colorants added to a tint base,
29 when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following
30 chemical restrictions; these requirements do not apply to primers or finishes that are applied in a
31 fabrication or finishing shop:
32
33 1. Primer or Undercoat: VOC content of not more than 100 g/L (150 g/L with colorant
34 added at point-of-sale).
35 2. Flat Paints and Coatings: VOC content of not more than 50 g/L (100 g/L with colorant
36 added at point-of-sale).
37 3. Non-flat Paints and Coatings: VOC content of not more than 100 g/L (150 g/L with
38 colorant added at point-of-sale).
39 4. Floor Paint: VOC content of not more than 100 g/L (150 g/L with colorant added at
40 point-of-sale).
41 5. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by
42 weight of total aromatic compounds (hydrocarbon compounds containing one or more
43 benzene rings).
44 6. Restricted Components: Paints and coatings shall not contain any of the following:
45
46 a. Acrolein.
47 b. Acrylonitrile.
48 c. Antimony.
49 d. Benzene.
50 e. Butyl benzyl phthalate.
51 f. Cadmium.
52 g. Di (2-ethylhexyl) phthalate.
53 h. Di-n-butyl phthalate.
54 i. Di-n-octyl phthalate.

- 1 j. 1,2-dichlorobenzene.
- 2 k. Diethyl phthalate.
- 3 l. Dimethyl phthalate.
- 4 m. Ethylbenzene.
- 5 n. Formaldehyde.
- 6 o. Hexavalent chromium.
- 7 p. Isophorone.
- 8 q. Lead.
- 9 r. Mercury.
- 10 s. Methyl ethyl ketone.
- 11 t. Methyl isobutyl ketone.
- 12 u. Methylene chloride.
- 13 v. Naphthalene.
- 14 w. Toluene (methylbenzene).
- 15 x. 1,1,1-trichloroethane.
- 16 y. Vinyl chloride.
- 17
- 18 F. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- 19
- 20 2.03 PRIMERS/SEALERS
- 21
- 22 A. Interior Latex Primer/Sealer: MPI #50.
- 23
- 24 2.04 METAL PRIMERS
- 25
- 26 A. Rust-Inhibitive Primer (Water Based): MPI #107.
- 27
- 28 2.05 LATEX PAINTS
- 29
- 30 A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).
- 31
- 32 B. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
- 33
- 34 C. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
- 35
- 36 D. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
- 37
- 38 2.06 EQUIPMENT
- 39
- 40 A. Provide all brushes, rollers, ladders, scaffolding, and other equipment of any kind to properly
- 41 execute each type of work.
- 42
- 43
- 44 PART 3 - EXECUTION
- 45
- 46 3.01 EXAMINATION
- 47
- 48 A. Examine substrates and conditions, with Applicator present, for compliance with requirements
- 49 for maximum moisture content and other conditions affecting performance of work.
- 50
- 51 B. Maximum Moisture Content of Substrates:
- 52 1. Gypsum Board: 12 percent.
- 53 2. Concrete: Must be cured a minimum of 45 days.
- 54

- 1 C. Verify suitability of substrates, including surface conditions and compatibility with existing
2 finishes and primers.
3
4 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces
5 are dry.
6 1. Beginning coating application constitutes Contractor's acceptance of substrates and
7 conditions.
8

9 3.02 PREPARATION

- 10
11 A. Perform preparation and cleaning procedures in accord with paint manufacturer's instructions
12 and as specified for each particular substrate condition.
13
14 1. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and
15 similar items in place and not to be finish-painted, or provide surface-applied protection
16 prior to surface preparation and painting operations.
17 a. After completing painting operations, use workers skilled in the trades involved to
18 reinstall items that were removed. Remove surface-applied protection if any.
19 b. Do not paint over labels of independent testing agencies or equipment name,
20 identification, performance rating, or nomenclature plates.
21
22 2. Follow manufacturer's instructions for use of stripping solutions to avoid raising grain of
23 wood.
24 3. Do not dip fabricated units (doors, etc.) in stripping solution to avoid saturating wood or
25 damaging glued connections.
26 4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and
27 grease prior to mechanical cleaning.
28 5. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental
29 to formation of a durable paint film.
30
31 B. New wood: Prepare substrate and apply finish according to manufacturer's recommendations.
32 Apply to smooth clean surfaces only.
33
34 C. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level surfaces
35 taking care not to raise nap of paper.
36
37 D. Existing Ferrous Metal
38
39 1. Spot remove failed, damaged or rough existing paint to bare metal by means of stripping
40 as indicated above. If existing metal surface is not smooth, sand or wire brush.
41 a. Sand edges of existing paint to a feather edge.
42 2. Remove dirt and grease with mineral spirits or solvent recommended by paint
43 manufacturer and clean cloths.
44
45 E. Ferrous Metal
46
47 1. Remove dirt and grease with mineral spirits or solvent recommended by paint
48 manufacturer and clean cloths.
49 2. Where not galvanized, shop coat of primer will exist on surface. If prime coat is not
50 smooth, sand to bare metal and re-prime.
51

52 3.03 APPLICATION

- 1 A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to
2 disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
3
- 4 B. Do no interior work until building is properly enclosed.
5
- 6 C. Do work under adequate illumination and dust-free conditions.
7
- 8 D. Apply paints according to manufacturer's written instructions.
9 1. Use applicators and techniques suited for paint and substrate indicated.
10 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
11 Before final installation, paint surfaces behind permanently fixed equipment or furniture
12 with prime coat only.
13 3. Paint front and backsides of access panels, removable or hinged covers, and similar
14 hinged items to match exposed surfaces.
15
- 16 E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of
17 same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient
18 difference in shade of undercoats to distinguish each separate coat.
19
- 20 F. Materials
21 1. Do not open containers until required for use.
22 2. Stir materials thoroughly and keep at uniform consistency during application.
23
- 24 G. Coats
25 1. Number specified is minimum.
26 2. Touch up suction spots between coats.
27 3. If undercoats or other conditions show through topcoat, apply additional coats until cured
28 film has a uniform paint finish, color, and appearance.
29 4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush
30 marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp
31 lines and color breaks.
32 5. Refinish surfaces affected by refitting work.
33
- 34 3.04 COLOR SEPARATION
35
- 36 A. An average of one or two wall colors will be used per room. Ceilings generally will be a
37 different color than walls. Finished closets will usually be same as adjoining rooms.
38
- 39 B. Job painted metal items such as diffusers, grilles and registers will generally be same color as
40 adjacent surface.
41
- 42 C. Hardwood generally will be the same color stain throughout.
43
- 44 3.05 CLEANING
45
- 46 A. During the progress of this work, remove from the site all discarded paint materials, rubbish,
47 cans and rags at the end of each work day.
48
- 49 B. Upon completion of painting work, clean window glass and other paint-spattered surfaces.
50 Remove spattered paint by proper methods of washing and scraping, using care not to scratch or
51 otherwise damage finished surfaces.
52
- 53 3.06 PROTECTION
54

- 1 A. Protect work of other trades, whether to be painted or not, against damage by painting and
- 2 finishing work. Correct damage by cleaning, repairing or replacing.
- 3
- 4 B. Provide "wet paint" signs to protect newly-painted finishes. Remove temporary protective
- 5 wrappings, after completion of painting operations.
- 6
- 7 C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted
- 8 surfaces.
- 9

10 3.07 SCHEDULE OF INTERIOR WORK

- 11
- 12 A. In addition to obvious surfaces, the following do not require painting or finishing.
- 13 1. Do not include painting when factory-finishing or installer-finishing is specified for such
- 14 items as (but not limited to) acoustic materials, finished mechanical and electrical
- 15 equipment including light fixtures and distribution cabinets.
- 16 2. Painting is not required on surfaces such as walls or ceilings in concealed areas and
- 17 generally inaccessible areas, furred areas, utility tunnels, pipe spaces, duct shafts and
- 18 elevator shafts.
- 19 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and
- 20 similar finished materials will not require finish painting, unless otherwise indicated.
- 21 4. Moving parts of operating units, mechanical and electrical parts, such as valve and
- 22 damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not
- 23 require finish painting, unless otherwise indicated.
- 24 5. Do not paint over any code-required labels, such as Underwriter's Laboratories and
- 25 Factory Mutual, or any equipment identification, performance rating, name or
- 26 nomenclature plate.
- 27 6. N/A indicates system not applicable to this Project.
- 28
- 29 B. Walls and Ceilings
- 30 1. Paint all rooms. Paint patched walls from 90 degree corner or vertical expansion joint
- 31 cover in corridors, and patched ceilings complete.
- 32 2. Do not apply next coat until previous is thoroughly dry.
- 33 3. Provide final coat which is solid and even in color, free from runs, laps, sags, brush
- 34 marks, air bubbles and excessive roller stipple and worked into crevices, joints and
- 35 similar areas.
- 36
- 37 C. Wood/WoodTrim:
- 38 1. Apply finishes to all areas as shown on drawings.
- 39 2. Apply per manufacturer's instructions.
- 40
- 41 D. Electrical Panel Box Covers and Doors
- 42 1. Remove, paint and reinstall after paint is dry.
- 43
- 44 E. Other Unfinished and Primed Surfaces
- 45 1. Provide specified finish on exposed surfaces. This includes prime coated mechanical units,
- 46 piping, pipe covering, conduit, and interior duct surfaces visible behind grilles.
- 47
- 48 F. Interior Paint Schedule
- 49

System	Material	Type/Sheen	Number and Type of Coating
IPS-1	Wood	Latex/Eggshell	One coat "ProMar Primer"; Two coats "ProGreen 200 Low VOC Interior Latex Eg-shel"
IPS-4	Wood	Water-based Stain,	One coat "Wood Classics 250"; Two coats "Target Coatings 9000 Series 'Clear

			Coat' Polyurethane Ultra-Low VOC"; Custom colors to match A/E's finish control sample
IPS-7	Gypsum Board	Latex/Eggshell Zero-VOC	One coat "Harmony Interior Latex Primer"; Two coats "Harmony Interior Latex Eggshell"
IPS-8	Concrete Floor	Water -Based Acrylic Liquid Polymer	BASF MasterKure 200 WB
IPS-9	Concrete Masonry	Latex/Eggshell	One coat "Loxon Block Surfacer"; Two coats "Harmony Interior Latex Eggshell"
IPS-13	Ferrous Metal (Unprimed)	Latex/Semi-gloss	One coat "Pro-Cryl Universal Primer"; Two coats "ProClassic Waterborne"
IPS-14	Ferrous Metal (Primed)	Latex/Semi-gloss	One coat "Pro-Cryl Universal Primer"; Two coats "ProClassic Waterborne"
IPS-15	Copper/Aluminum (finished rooms only)	Latex/Flat	One coat "DTM Acrylic Primer; Finish"; Two coats "ProMar 200 Interior Latex Flat"
IPS-16	Galvanized Metal (finished rooms only)	Latex/Flat	One coat "DTM Acrylic Primer Finish"; Two coats "ProMar 200 Interior Latex Flat"

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3.08 SCHEDULE OF EXTERIOR WORK

- A. NA
 - 1. Paint or finish other new, unfinished and primed surfaces noted on drawings.
 - 2. Provide aggregate in quantity as recommended by manufacturer and mix according to manufacturer's written instructions.

3.09 PAINT COLOR SCHEDULE

- A. PT-1: Field
- B. PT-2: Ceilings
- C. PT-3: Accent
- D. PT-4: Accent
- E. PT-5: Accent
- F. PT-6: Clear Stain
- G. Seal all exposed concrete floors receiving no finish.

END OF SECTION

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SECTION 10 14 00
INFORMATION SPECIALTIES

PART 1:GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Accessibility Signage.

1.03 REFERENCES

- A. All signage shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Manufacturer's Literature: Materials description, colors, and application instructions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide protective coverings for identifying devices prior to shipping.
B. Handle and store to prevent damage and soiling.

PART 2:PRODUCTS

2.01 ADA REQUIRED ACCESSIBILITY SIGNAGE

- B. All interior signage must have tactile/Braille lettering and raised pictograms. Braille must be integral to the sign. Taped on Braille is not acceptable.
1. All Braille to be located at the bottom of the sign.
2. When the word "accessible" is used on a sign or when the symbol for accessibility is used, the word accessible must be included in the Braille text.
- C. Basis of Design: Interior Signs.
1. ADA-Ready™, InTouch Series™, ASI Sign Systems, Inc.
a. ADA Signage
2. Graphics: Standard
3. Sizes: 6"x9"
4. Color: 2, to be selected by Architect from Manufacturer's full line.
- D. Manufacturers
1. ASI Sign Systems.
2. Poblocki Sign Company
3. Best Sign Systems Inc.

- 1 4. 2/90 Sign Systems
2 5. Or approved equal.
3
4 E. Provide proper gender symbol at each door leading to a room designed for handicap use (i.e., toilet rooms
5 with grab bars, etc.).
6
7

8 PART 3:EXECUTION

9
10 3.01 INSTALLATION

- 11
12 A. Comply with manufacturer's specifications and recommendations for the installation of identification devices.
13
14 C. Install devices plumb, level and true to line.
15
16 D. Install room and door identification signs at 5 feet from centerline of signs to finished floor.
17 1. When used in conjunction with accessibility symbol, mount below symbol.
18

19 3.02CLEANING

- 20 A. Clean surfaces of identifying devices, dedication plaque and surrounding surfaces.
21
22 B. Remove protective coatings, if any.
23
24

25 3.03SIGNAGE SCHEDULE

- 26
27 A. ADA Signage to be provided at Restrooms.
28
29

END OF SECTION 10 14 00

SECTION 10 22 26

OPERABLE PANEL PARTITIONS (ALTERNATE NO. 1)

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

A. Section Includes

- 1. Movable flat panel partitions, fabric clad, single panels.
- 2. Ceiling track with ceiling guards and all brackets, threaded rods and all materials needed to suspend the track from the steel structural support as detailed in the plans.

B. Related Sections

- 1. Section 06 20 00, Rough Carpentry
- 2. Section 05 50 00, Metal Fabrications

1.03 WORK INCLUDED

- A. Manually operated, continuously hinged panel partitions.

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.

B. Shop Drawings and Product Data:

- 1. Submit Product Data describing partition operation, hardware and accessories, colors and finishes available.

- C. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, numbered panel installation sequence, attachments to other construction, and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others. Include the following:

- D. Calculations: Calculate requirements for supporting operable panel partitions and verify capacity of carriers and track components to support loads; indicate deflection limits for partition and adjacent construction.

- E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied powder coat color finishes.

- F. Field Measurements: Verify operable panel partition openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- G. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and storage dimensions and proceed with fabricating operable panel

1 partitions without field measurements. Coordinate construction to ensure that actual opening
2 dimensions correspond to established dimensions.

3
4 1.05 QUALITY ASSURANCE

5
6 A. Fire-Test-Response Characteristics: Provide operable panel partitions with the following fire-
7 test-response characteristics, as determined by testing identical products per test method
8 indicated below by UL or another testing and inspecting agency acceptable to authorities
9 having jurisdiction. Identify materials with appropriate markings of applicable testing and
10 inspecting agency.

- 11 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
12 a. Flame Spread: 25 or less.
13 b. Smoke Developed: 450 or less.
14 2. Fire Growth Contribution: Textile wall coverings complying with the acceptance
15 criteria of UBC Standard 8-2.
16 3. Sound Transmission Loss: ASTM E90; minimum STC of 52, +/- 1 STC, tested on 100
17 square foot opening.
18 4. Limit installed track deflection under load to .10 inch.

19
20 1.06 ENVIRONMENTAL REQUIREMENTS

21
22 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the
23 building (defined as inside the weatherproofing system and applied on site) must not exceed
24 the following requirements.

- 25 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
26 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
27 date January 7, 2005.
28 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36,
29 requirements in effect on October 19, 2000.

30
31
32 PART 2 - PRODUCTS

33
34 2.01 PRODUCTS AND MANUFACTURERS

35
36 A. Manufacturers: Subject to compliance with requirements, provide products by one of the
37 following:

- 38 1. Product: Kwik-Wall 2030 hinged pairs
39 a. Partition with type 850 track/carrier system.
40 b. Provide both top and bottom retractable seals on all panels including expandable
41 closure panels. Top seal provide 1" clearance from the track and the bottom seal
42 shall provide 2" clearance from the floor. Sweep type seals shall not be
43 acceptable.
44 c. Fabric Color/Pattern: Vinyl to be selected from manufacturer's full range.
45 d. STC: Not less than 51.
46 2. Modernfold, Inc. 931 with 860 track/carrier system (similar product to the Kwik-wall
47 product mentioned above)
48 3. Or approved equal.

49
50 B. Materials

- 51 1. Steel Frame: Steel sheet, not less than 0.0478-inch nominal specified thickness for
52 uncoated steel.

- 1 2. Suspension Tracks: Steel or aluminum with adjustable steel hanger rods for overhead
2 support, designed for type of operation, size, and weight of operable panel partition
3 indicated. Size track to support partition operation and storage without damage to
4 suspension system, operable panel partitions, or adjacent construction. Limit track
5 deflection to no more than 0.10 inch between bracket supports. Provide a continuous
6 system of track sections and accessories to accommodate configuration and layout
7 indicated for partition operation and storage.
- 8 3. Panel Guide: Aluminum; finished with factory-applied, powder coat finish chosen from
9 manufacturer's full range by A/E.
- 10 4. Head Closure Trim: As required for acoustical performance; primed for field finish.
- 11 5. Carriers: Trolley system as required for configuration type, size, and weight of partition
12 and for easy operation; with ball-bearing wheels.
- 13 6. Track Intersections, Switches, and Accessories: As required for type of operation,
14 storage, track configuration, and layout indicated for operable panel partition, and
15 compatible with partition assembly specified. Fabricate track intersections and switches
16 from steel or aluminum.
- 17
- 18 C. Operable Panel Partitions
- 19 1. Panel Construction: Provide top reinforcement as required to support panel from
20 suspension components and provide reinforcement for hardware attachment. Fabricate
21 panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-
22 place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance;
23 and free of bow, warp, twist, deformation, and surface and finish irregularities.
- 24 2. Faces are full height 18 gauge steel with gypsum backer board.
- 25 3. Glass fiber insulation at interior of panel.
- 26 4. Dimensions: Fabricate operable panel partitions, from manufacturer's standard sizes, to
27 form an assembled system of dimensions indicated on Drawings and verified by field
28 measurements.
- 29 5. Trim: Manufacturer's standard aluminum trim, finished as follows:
30 a. Powder Coated, as selected by Architect from manufacturer's full range.
31 b. Hardware: Manufacturer's standard as required to operate operable panel
32 partition and accessories; with decorative, protective finish.
- 33
- 34 6. Seals: General: Provide types of acoustical seals indicated that produce operable panel
35 partitions complying with acoustical performance requirements and the following:
36 a. Seals made from materials and profiles that minimize sound leakage.
37 b. Seals fitting tight at contact surfaces and sealing continuously between adjacent
38 panels and between operable panel partition perimeter and adjacent surfaces,
39 when operable panel partition is extended, closed, and in place.
40 c. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of
41 panel, with continuous acoustical seal.
42 d. Retractable top seals.
43 e. Horizontal Bottom Seals: Mechanical, retractable, constant-force-contact seal
44 exerting uniform constant pressure on floor when extended, ensuring horizontal
45 and vertical sealing and resisting panel movement.
46 1) Top and bottom seals to operate from the edge of the panel with a
47 removable handle.
- 48 7. Finish Facing
49 a. General: Provide finish facings that comply with indicated fire-test-response
50 characteristics and that are factory applied to operable panel partitions with
51 appropriate backing, using mildew-resistant nonstaining adhesive as
52 recommended by facing manufacturer's written instructions.

- 1 b. Apply one-piece, seamless facings free from air bubbles, wrinkles, blisters, and
2 other defects, with no gaps or overlaps. Horizontal butt edges are not permitted.
3 Tightly secure and conceal raw and selvage edges of facing for finished
4 appearance.
5 c. Where facings with directional or repeating patterns or directional weave are
6 indicated, mark facing top and attach facing in same direction.
7 d. Match facing pattern 72 inches above finished floor.
8 e. Fabric Wall Covering: Manufacturer's Premium Custom, fabric, from same dye
9 lot, treated to resist stains.
10 8. Steel Finish: Factory-applied, corrosion-resistant, protective coating, unless otherwise
11 indicated.

12
13 2.02 EXAMINATION

- 14
15 A. Examine flooring, structural support, and opening, with Installer present, for compliance with
16 requirements for installation tolerances and other conditions affecting performance of operable
17 panel partitions. Proceed with installation only after unsatisfactory conditions have been
18 corrected.
19

20
21 PART 3 - EXECUTION

22
23 3.01 INSTALLATION

- 24
25 A. General: Comply with ASTM E 557, operable panel partition manufacturer's written
26 installation instructions, Drawings, and approved Shop Drawings.
27
28 B. Adjusting
29 1. Adjust operable panel partitions to operate smoothly, easily, and quietly, free from
30 binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption,
31 or malfunction, throughout entire operational range. Lubricate hardware and other
32 moving parts.
33
34 C. Remove all packaging materials from premises.
35

36
37 END OF SECTION 10 22 26

SECTION 10 28 00

TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Commercial Toilet and Bath Accessories

1.03 RELATED WORK

- A. Section 06 10 00, Rough Carpentry: Wall Blocking.

1.04 REFERENCES

- A. All work of this section shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Manufacturer's technical data.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packaging with seals unbroken and bearing manufacturer's name and product.
B. Store all materials in secure place to prevent damage.
C. Remove all damaged materials from project immediately.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as inside the weatherproofing system and applied on site) must not exceed the following requirements.
1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on October 19, 2000.

PART 2 - PRODUCTS

2.01 COMMERCIAL TOILET ACCESSORY MANUFACTURERS

- A. Bobrick Washroom Equipment, Inc.

- 1
- 2 B. Kimberly Clark
- 3
- 4 C. Bradley Corporation.
- 5
- 6 D. Dyson
- 7
- 8 E. Excel
- 9
- 10 F. American Specialties, Inc.
- 11
- 12 G. Neo Metro.
- 13
- 14 H. Hospital Specialty Co.
- 15
- 16 I. Georgia Pacific
- 17
- 18 J. Or approved equal.
- 19
- 20 2.02 MANUFACTURED COMMERCIAL UNITS
- 21
- 22 A. Waste Bin:
- 23 1. Bobrick B-43644 ConturaSeries® Series Recessed Waste Receptacle with LinerMate
- 24 2. Or approved equal.
- 25
- 26 B. Paper Towel Dispenser OFCI:
- 27 1. Bobrick B-4262 ConturaSeries® Surface Mounted Paper Towel Dispenser with TowelMate
- 28 2. Or approved equal.
- 29
- 30 C. Toilet Roll Holder OFCI:
- 31 1. Georgia Pacific Compact Vertical Double Roll Bathroom Tissue Dispenser, Stainless: 56782
- 32 2. Or approved equal.
- 33
- 34 D. Sanitary Napkin Disposal:
- 35 1. Bobrick B-270 ConturaSeries® Surface-Mounted Sanitary Napkin Disposal
- 36 2. Or approved equal.
- 37
- 38 E. Grab Bars:
- 39 1. Bobrick B-6806 Series Grab Bars, lengths as indicated in drawings.
- 40 2. Or approved equal.
- 41
- 42 E. Mirrors:
- 43 1. Bobrick B-165 Series. Stainless Steel Framed: Sizes per drawings.
- 44 2. Or approved equal.
- 45
- 46 F. Soap Dispenser, OFCI:
- 47 1. Georgia Pacific enMotion Automated Touchless Foam Soap Dispenser: 52053
- 48 2. Or approved equal.
- 49
- 50 G. Coat Hook
- 51 1. Bobrick, B-542, Stainless Steel
- 52 2. Or approved equal
- 53
- 54 2.03 SEALANT

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A. "G-E silicone sealant", General Electric Company.

B. "Dow Corning 780", Dow Corning Corporation.

C. "Pecora 826", Pecora Chemical Corporation.

2.04 FASTENERS

A. Provide all fastening devices including screws, bolts, anchors, and backplates.

B. Exposed fasteners shall match finish of accessories.

2.05 FABRICATION

A. Fabricate all toilet and bath accessories of type 302 or 304 stainless steel with satin finish, unless otherwise specified or approved.

B. All accessories shall be by one manufacturer unless otherwise specified or approved.

C. Manufacturer's labels or imprinted name shall not be visible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and recesses to receive toilet and bath accessories for dimensions, plumbness, blocking, and other conditions that affect installation.

B. Do not proceed until conditions are acceptable.

3.02 INSTALLATION

A. Install toilet and bath accessories according to manufacturer's direction.

B. All accessories in any one space shall be of matching design and finish. If discrepancies are found, secure Architect's approval before proceeding.

C. Set all recessed and semi-recessed accessories with continuous seal of sealant, around entire perimeter of all accessories to prevent moisture from reaching substrate.

3.03 ADJUSTING AND CLEANING

A. Adjust accessories for proper operation.

B. Replace damaged or defective items.

C. Clean and polish accessories after removing labels and protective wrapping.

D. Delivery accessory keys, service, and parts manual in accordance with the General Conditions of the Contract Closeout.

END OF SECTION 10 28 00

SECTION 10 41 16

EMERGENCY ACCESS KEY BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Emergency Access Key Boxes.

1.03 RELATED WORK

- A. Section 06 10 00, Rough Carpentry.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Product Data: Manufacturer's catalog information and specifications edited to indicate specific access boxes or vaults and accessories to be provided for this Project. Include rough opening dimensions and certification of U.L. rating.

PART 2 - PRODUCTS

2.04 EMERGENCY ACCESS KEY BOX:

1. 1/4" fully welded steel plate housing with 1/2" thick steel door with interior gasket seal and stainless steel hinge.
2. Recessed/flush mount
 - a. Install using only manufacturer supplied and approved methods and materials.
3. Dimensions:
 - a. 7"H x 7"W x 5"D exterior of box.
 - b. 9-1/2" x 9-1/2" Recess Mount Flange.
4. Box and lock to be UL listed.
 - a. Lock to have 1/8" thick dust cover and be tamper resistant.
 - b. Hardened steel pins and double action rotating tumblers, accessed by a biased cut key.
5. Boxes shall have tamper switches monitored through METASYS.
6. Color: To be chosen from manufacturer's full range.
7. Manufacturer:
 - a. Knox Box Series 4400.
 - b. Emergency Access Systems Inc.
 - c. Or approved equal.
8. Contractor to coordinate with the Madison Fire Dept. for product ordering. The specific box is selected and ordered by the Madison Fire Dept.

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PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all items in accordance with manufacturer's written instructions.
- B. Prepare recesses in wall for access boxes.
- C. Mount boxes at (6) six feet high or as shown on drawings.
- D. Protect box from staining or damage from adjacent construction.
- E. Replace any damaged components; touch-up is not acceptable.

END OF SECTION 10 41 16

SECTION 10 44 13

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 WORK INCLUDED

- A. Stainless Steel Fire Extinguisher Cabinets.

- B. Fire Extinguishers

1.03 RELATED WORK

- A. Rough Carpentry 06 10 00

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.

1. Product Data: Manufacturer's catalog information and specifications edited to indicate specific extinguishers, cabinets and accessories to be provided for this Project. Include rough opening dimensions and certification of U.L. rating.

1.05 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: 6 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304.

- B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

- 1
2 2.02 FIRE EXTINGUISHER CABINET
3
4 A. Basis of Design: Larsen Manufacturing, Architectural Series, Vertical Duo, clear acrylic door, #4
5 stainless steel.
6 1. FX-1: Recessed
7 2. FX-2: Semi-recessed.
8 3. FX-3: Surface mounted.
9
10 B. Products: Subject to compliance with requirements products by additional manufacturers that may be
11 incorporated into the Work include the following; submit for approval:
12 1. J. L. Industries, Inc., a division of Activar Construction Products Group.
13 2. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
14 3. Potter Roemer LLC.
15
16 C. Cabinet Construction: Nonrated and rated same as adjacent structure.
17 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-
18 inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material.
19 Provide factory-drilled mounting holes.
20
21 D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim
22 indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall
23 surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of
24 insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed
25 cabinet installation.
26 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
27
28 E. Cabinet Trim Material: Same material and finish as door.
29
30 F. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type,
31 trim style, and door material and style indicated.
32 1. Provide continuous hinge, of same material and finish as trim, permitting door to open 180
33 degrees.
34
35 G. Accessories
36 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire
37 protection cabinet, of sizes required for types and capacities of fire extinguishers indicated,
38 with plated or baked-enamel finish.
39 a. For FX-3: Kidde Fire Extinguisher Wall Hanger, model to accommodate extinguisher
40
41 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into
42 face.
43 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size,
44 spacing, and location.
45 a. Identify fire extinguisher in fire protection cabinet with the words "FIRE
46 EXTINGUISHER."
47 1) Location: Applied to cabinet glazing.
48 2) Application Process: Decals.
49 3) Lettering Color: Red.
50 4) Orientation: Vertical
51
52 4. Alarm: Manufacturer's standard alarm that actuates when fire protection cabinet door is
53 opened and that is powered by batteries.
54

- 1 2.03 FABRICATION
2
3 A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and
4 hardware to suit cabinet type, trim style, and door style indicated.
5 1. Weld joints and grind smooth.
6 2. Provide factory-drilled mounting holes.
7 3. Prepare doors and frames to receive locks.
8 4. Install door locks at factory.
9
10 B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and
11 coordinated with cabinet types and trim styles selected.
12 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch
13 thick.
14 2. Miter and weld perimeter door frames.
15
16 C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
17
18 2.04 GENERAL FINISH REQUIREMENTS
19
20 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
21 recommendations for applying and designating finishes.
22
23 B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying
24 a strippable, temporary protective covering before shipping.
25
26 C. Finish fire protection cabinets after assembly.
27
28 D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in
29 appearance of adjoining components are acceptable if they are within the range of approved Samples
30 and are assembled or installed to minimize contrast.
31
32 2.05 STAINLESS-STEEL FINISHES
33
34 A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
35 B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
36 1. Run grain of directional finishes with long dimension of each piece.
37 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter
38 and leave surfaces chemically clean.
39 3. Directional Satin Finish: No. 4.
40
41 2.06 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS
42
43 A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet indicated.
44 1. Basis-of-Design Product: Subject to compliance with requirements, provide Larsen's
45 Manufacturing MP2, MP5 and MP5-A where indicated or comparable product by one of the
46 following:
47 a. Amerex
48 b. Ansul, Sentry
49 c. Badger Fire Protection; a Kidde company.
50 d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
51 e. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
52 f. Potter Roemer LLC.
53 g. Tyco
54

- 1 2. Valves: Manufacturer's standard.
- 2 3. Handles and Levers: Manufacturer's standard.
- 3 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- 4
- 5 B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 1-A:10-B:C, 2.5-lb, 2-A:10-B:C, 5-
- 6 lb and 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in
- 7 enameled-steel container.
- 8
- 9

10 PART 3 - EXECUTION

11

12 3.01 EXAMINATION

- 13
- 14 A. Examine fire extinguishers for proper charging and tagging.
- 15 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- 16
- 17 B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 18

19 3.02 INSTALLATION

- 20
- 21 A. Install all items in conformance with manufacturer's directions.
- 22
- 23 B. Prepare recesses in wall for fire extinguisher cabinets.
- 24
- 25 C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb. No
- 26 gaps are allowed between cabinet edge and wall surface.
- 27
- 28 D. Mount fire extinguishers in cabinets or on wall brackets so the top of the extinguisher is not more
- 29 than 4 feet above the floor.
- 30
- 31 E. Clean fire extinguisher cabinet and extinguisher of all dirt, residue, or smudges.
- 32
- 33 F. Replace any damaged components; touch-up is not acceptable.
- 34
- 35
- 36

END OF SECTION 10 44 13

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SECTION INCLUDES:

- A. Manually operated sunscreen roller shades, see schedule in PART 2.

1.03 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
- B. Section 09 29 00 - Gypsum Board: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
- C. Section 09 51 00 - Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.04 REFERENCES

- A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.05 SUMMARY

- A. Provide window shades and accessories as follows:
- B. Shade fabric: Fire resistant, openness factor as specified and required by orientation and glazing.
1. Single sunscreen shadeband with specified weave.
 2. Weave and color to be chosen from manufacturer's full line.
- C. Operation / Manual, unless noted otherwise.
1. Offset side-mounted chain operator for manual operation as either single-band or multi-band shades.
 2. Public facility assembly: Chain hold down, spring-tension pulley and shock absorber.
 3. Mounting: Wall-mounted with brackets, overhead mounted, or jamb-mounted.
 4. Shade orientation: Regular roll, shade cloth falls at window side of roller.
 5. Configuration: Single band or multi-band shades.
 6. Accessories without exposed fastening as indicated on drawings:
 - a. Single fascia: One-piece extruded aluminum.
 - b. Double fascia: One-piece extruded aluminum, front and back mounting.

1.06 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract:
1. Samples, shop drawings, product drawings, product data and warranty.

2. Submittals shall specifically note any deviations from specified requirements and the reasons thereof.
3. For electrically operated units, include detailed wiring diagrams and schematics.

1.07 QUALITY ASSURANCE

- A. Comply with governing codes/regulations. Provide products of acceptable manufacturers with satisfactory use in similar service for three years. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. Manufacturer: MechoShade Systems, Inc.
 1. MechoShade™ manually operated units.
- B. Approved equal by Lutron Electronics Co., Inc. or approved equal.
- C. Shade cloth: Shade cloth shall meet requirements of Fed. Spec. CCC-C-521E for fire retardancy, NFPA 701 Small-Scale and/or NFPA 701 Large-Scale requirements. Anti-microbial without topical treatment. NY State Fire-Gas Toxicity Text: LC50 22.5 g. ASTM E-84-90: Flame Spread 17, Smoke Density Index 118, Shade cloth seconds or shade cloth manufactured using reprocessed materials are not acceptable.
 1. WIN-1 Solar Shade:
 - a. Ecoveil by Mechoshade.
- D. Manual Shade System
 1. Pre-engineered unit with one-piece molded sprockets and a linear disc brake opposed to a flat steel backing plate and concealed variable-adjustment mechanism. Shade mechanism shall be adjustable from 100% friction (static mode) with infinite positions to 15% friction (dynamic mode) with only pre-selected positions. The operator shall be a side-mounted gear and sprocket mechanism located within the drive-end bracket. The shade cloth shall be removable with a snap-on and snap-off mounting spline without having to remove the shade tube.
- E. Fascia
 1. Extruded aluminum pocket with exposed tile support and pocket closure with baked-enamel finish.
 2. Accessibility by removing closure. No exposed screws or mounting means. Pocket shall be sized as indicated on drawings for:
 - a. Single shadeband.
 - b. Overlapping shades (two rolls of shade cloth) either high-low or side-by-side mounting for room darkening without center blackout channels.
 - c. Extruded aluminum fascia which continuously fits on the end and center brackets as a one piece section over two or more shadebands.
- F. Location Schedule
 1. All Windows, full height: South, West and East except at Vestibule, 100.
 - 1) One at each pane of glass below the spandrel only.

PART 3 - EXECUTION

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3.01 INSTALLATION

- A. Take field measurements prior to the fabrication to ensure fit.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals.
- C. Coordinate with lighting control installer.

3.02 WARRANTY: INTERIOR SHADES

Ten-year warranty on manually operated components, except bead chain which is a maintenance / service item. Ten-year warranty on shade cloth with provision that it will not deteriorate, sag or warp and will remain fit for use for the full warranty period when used as an interior rollershade. Warrant hardware components to be free from defects in material and workmanship under the normal and proper use for a period of ten (10) years from date of substantial completion.

END OF SECTION 12 24 13

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SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.2 SCOPE

- 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. Included are the following topics:

1. PART 1 GENERAL

- a. Related Documents
- b. Scope
- c. Regulatory Requirements
- d. Reference Standards
- e. Quality Assurance
- f. Abbreviations and Symbols
- g. Definitions
- h. Coordination
- i. Continuity of Existing Services
- j. Protection of Finished Surfaces
- k. Sealing and Firestopping
- l. Off Site Storage
- m. Submittals
- n. Specified Materials and Equipment
- o. Equipment Installation
- p. Operating and Maintenance Manuals
- q. Record Drawings
- r. Testing
- s. Cleaning
- t. Warranty

2. PART 2 PRODUCTS

- a. Access Panels and Doors
- b. Pipe Penetrations
- c. Equipment, Piping, and Valve Identification
- d. Equipment Accessories

3. PART 3 EXECUTION

- a. General
- b. Surface Restoration
- c. Openings, Cutting and Patching
- d. Building Access
- e. Equipment Access
- f. Coordination of Work

- g. Piping Installation
- h. Sleeves
- i. Pipe Penetrations
- j. Escutcheon Plates
- k. Painting
- l. Identification

1.3 REGULATORY REQUIREMENTS

A. Codes and Standards:

1. All plumbing work shall conform to the requirements of Wisconsin State Administrative Code SPS 381-384.
2. All materials and workmanship shall comply with applicable Codes, local ordinances, industry standards and utility regulations. In case of differences between such Codes, and the Contract Documents, the most stringent shall govern. Promptly notify the A/E in writing of any such difference.

B. Non-Compliance:

1. Should the Contractor perform any work that does not comply with the above requirements, without having notified the A/E, he shall bear all costs necessary to correct the deficiencies.

C. Permits, Inspections and Fees:

1. All required, permits, and inspections shall be requested and obtained by the Contractor.
2. All fees and charges for approvals, reviews, or other inspections shall be paid by the Contractor.
3. All fees and charges assessed by local utilities for water, sewer, gas or other services shall be included in the bid and shall be paid by the Contractor(s).

1.4 REFERENCE STANDARDS

A. Standards cited in the Specifications shall be the most recent editions.

B. Abbreviations of standards organizations referenced in this and other sections are as follows:

1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. ASPE American society of Plumbing Engineers
4. ASSE American Society of Sanitary Engineering
5. ASTM American Society for Testing and Materials
6. AWWA American Water Works Association
7. AWS American Welding Society
8. CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
9. EPA Environmental Protection Agency
10. FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
11. IAPMO International Association of Plumbing & Mechanical Officials

- 1 12. IEEE Institute of Electrical and Electronics Engineers
- 2 13. ISA Instrument Society of America
- 3 14. MCA Mechanical Contractors Association
- 4 15. MICA Midwest Insulation Contractors Association
- 5 16. MSS Manufacturer's Standardization Society of the Valve & Fitting
- 6 Industry, Inc.
- 7 17. NBS National Bureau of Standards
- 8 18. NEC National Electric Code
- 9 19. NEMA National Electrical Manufacturers Association
- 10 20. NFPA National Fire Protection Association
- 11 21. NSF National Sanitation Foundation
- 12 22. PDI Plumbing and Drainage Institute
- 13 23. UL Underwriters Laboratories Inc.

14
15 C. Standards referenced in this section:

- 16 1. ACI 614 Recommended Practice for Measuring, Mixing and Placing of
- 17 Concrete
- 18 2. ASTM D1557 Standard Test Method for Moisture-Density Relations of Soils
- 19 3. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire
- 20 Stops
- 21 4. ASTM E84 Standard Test Method for Surface Burning Characteristics of
- 22 Building Materials
- 23 5. UL1479 Fire Tests of Through-Penetration Firestops
- 24 6. UL723 Surface Burning Characteristics of Building Materials

25
26 1.5 QUALITY ASSURANCE

- 27
- 28 A. Substitution of Materials: Refer to Division 01 of the Project Manual.
- 29
- 30 B. All products and materials used are to be new, undamaged, clean and in good
- 31 condition. Existing products and materials are not to be reused unless specifically
- 32 indicated.
- 33
- 34 C. Where equipment or accessories are used which differ in arrangement, configuration,
- 35 dimensions, ratings, or engineering parameters from those indicated on the contract
- 36 documents, the contractor is responsible for all costs involved in integrating the
- 37 equipment or accessories into the system and for obtaining the intended performance
- 38 from the system into which these items are placed.
- 39

40 1.6 ABBREVIATIONS AND SYMBOLS

- 41
- 42 A. Key to abbreviations and symbols shall be on the Drawings.
- 43
- 44 B. The following are additional abbreviations used in the Specifications:
- 45 1. A/E Architect/Engineer
- 46 2. GC General Contractor
- 47 3. PC Plumbing Contractor
- 48 4. HC Heating Ventilating and Air Conditioning Contractor
- 49 5. EC Electrical Contractor

1 1.7 DEFINITIONS

- 2
- 3 A. Furnish: Supply and deliver to Project site ready for unpacking, assembly and
4 installation.
- 5 B. Install: Operations at Site including unpacking, assembling, erecting, placing,
6 anchoring, applying, finishing, cleaning, and connecting related devices required for
7 product fully functional for intended use after installation.
8
- 9 C. Provide: Furnish and install, such that product is fully functional for intended use.

10

11 1.8 COORDINATION

- 12
- 13 A. The Drawings show the general arrangement of piping and equipment and shall be
14 followed as closely as actual building construction and the work of other trades
15 permits. Architectural and Structural Drawings shall take precedence. Because of the
16 scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories
17 which may be required. Investigate conditions affecting the Work and arrange
18 accordingly, providing offsets, fittings and accessories as may be required to meet
19 conditions.
20

21 1.9 CONTINUITY OF EXISTING SERVICES

- 22
- 23 A. Refer to Division 01 of the Project Manual.
- 24
- 25 B. Do not interrupt or change existing services without prior approval from Owner,
26 Architect, Engineer or Construction Manager. When interruption is required,
27 coordinate down-time with Owner to reduce disruption to activities. Scope of Work is
28 indicated on Contract Documents or described herein. Unless specifically stated, any
29 work involved in interrupting or changing existing services is to be done during
30 normal working hours.
31

32 1.10 PROTECTION OF FINISHED SURFACES

- 33
- 34 A. Refer to Division 01 of the Project Manual.
- 35
- 36 B. Furnish one can of touch-up paint for each different color factory finish to be finished
37 surface of product. Deliver touch-up paint with other "loose and detachable parts" as
38 covered in General Requirements.
39

40 1.11 SEALING AND FIRESTOPPING

- 41
- 42 A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or
43 structural opening shall be the responsibility of the contractor whose work penetrates
44 the opening. The contractor responsible shall hire individuals skilled in such work to
45 do the sealing and fireproofing. These individuals hired shall normally and routinely
46 be employed in the sealing and fireproofing occupation.
47

- 1 1.12 OFF SITE STORAGE
2
3 A. Refer to Division 01 of the Project Manual.
4
5 1.13 SUBMITTALS
6
7 A. Refer to Division 01, of the Project Manual.
8
9 B. Submit shop drawings with space for approval stamps of GC and A/E.
10
11 C. Submit the following plumbing system data sheet for approval by the GC and A/E.
12 List piping material type for each piping service on the project, ASTM number,
13 schedule or pressure class, joint type, manufacturer and model number where
14 appropriate. List valves and specialties for each piping service, fixture and equipment
15 with manufacturer and model number.
16
17 D. PLUMBING SYSTEM DATA SHEET
18

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Check			
Other			
Pipe Specialties:			
Strainers			
Hangers & Supports			
Insulation			
Fixtures:			
Sink			
Lavatory			
Faucet			
Trap			
Water Closet			
Fixtures Stops			
Equipment:			
Water Softener			
Water Heater			
Circulation Pump			

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42 E. Submit manufacturer's color charts where finish color is specified to be selected by
43 Architect/Engineer.
44
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48

- 1 F. Shop drawing submittals are to be bound, labeled, contain the project manual cover
2 page and a material index list page showing item designation, manufacturer and
3 additional items supplied with the installation. Submit for all equipment and systems
4 as indicated in the respective specification sections, marking each submittal with that
5 specification section number. Mark general catalog sheets and drawings to indicate
6 specific items being submitted and proper identification of equipment by name and/or
7 number, as indicated in the contract documents. Include wiring diagrams of
8 electrically powered equipment.
9
- 10 G. Submit sufficient quantities of data sheets and shop drawings to allow the following
11 distribution:
- | | | |
|----|--------------------------------------|----------|
| 12 | 1. Operating and Maintenance Manuals | 2 copies |
| 13 | 2. Architect/Engineer | 2 copies |
| 14 | 3. Local Fire Chief or Marshal | 1 copy |
- 15
- 16 H. Firestop Systems:
- 17 1. Contractor shall submit product data for each firestop system. Submittals shall
18 include product characteristics, performance and limitation criteria, test data,
19 MSDS sheets, installation details and procedures for each method of installation
20 applicable to this project. For non-standard conditions where no UL tested
21 system exists, submit manufacturer's drawings for UL system with known
22 performance for which an engineering judgement can be based upon.
23

24 1.14 SPECIFIED MATERIALS AND EQUIPMENT

- 25
- 26 A. Design is based on equipment specified by manufacturer and model number as
27 specified on Drawing Schedules. Where certain items are specified by manufacturer
28 or trade name, Contractor's bid shall be based on use of named item. Where one (1)
29 make is described and other makes are listed, comparable models of other named
30 equipment may also be used, provided they meet requirements of Specifications.
31
- 32 B. When equipment or accessories used differ in arrangement, configuration,
33 dimensions, ratings, or engineering parameters from those on Drawing schedules,
34 Contractor shall be responsible for costs involved in integrating equipment or
35 accessories into system. Contractor shall be responsible for obtaining original design
36 performance from system into which items are placed, regardless of whether
37 manufacturer/model is specified equivalent or substitute.
38
- 39 C. If Contractor wishes to use items other than those named in Specifications in base bid,
40 request for approval of substitution must be made in writing to A/E at least 14 days
41 prior to opening of bids. Include complete technical and descriptive data with request.
42 If approved, an Addendum will be issued notifying bidders of approval. Request for
43 approval will be considered only if requested by prime bidding Contractor.
44
45
46

1 1.15 EQUIPMENT INSTALLATION
2

- 3 A. Drawings show general arrangement and location of equipment and appurtenances. It
4 is Contractor's responsibility to install equipment in a location and manner that allows
5 for proper service and maintenance access to equipment. Work shall generally
6 conform to requirements shown on Drawings. However, location of equipment may
7 require field adjustments to obtain required service space. DO NOT SCALE OFF
8 PLANS to determine proper location of equipment. Because of scale of Drawings, it is
9 not possible to indicate exact routing of piping, and offsets, fittings and accessories
10 required to provide proper service access to equipment. Contractor shall route and
11 install ductwork and piping to provide required service access to equipment.
12
- 13 B. If, during construction phase of Project, contractor feels inadequate space exists, or
14 equipment locations must be substantially modified to provide proper service and
15 maintenance access, prior to installing equipment, contractor shall notify engineer in
16 writing, outlining general concerns and proposed modifications. Equipment installed
17 without providing manufacturer's required maintenance and service clearance shall be
18 considered defective. Contractor shall remove and relocate piping, ductwork and
19 equipment, to provide required service clearances at contractor's expense.
20

21 1.16 OPERATING AND MAINTENANCE INSTRUCTIONS
22

- 23 A. Refer to Division 01 of the Project Manual.
24
- 25 B. Assemble material in three-ring or post binders, using an index at the front of each
26 volume and tabs for each system or type of equipment. In addition to the data
27 indicated in the General Requirements, include the following information:
28 1. Copies of all approved shop drawings.
29 2. Manufacturer's wiring diagrams for electrically powered equipment
30 3. Records of tests performed to certify compliance with system requirements
31 4. Certificates of inspection by regulatory agencies
32 5. Parts lists for fixtures, equipment, valves and specialties.
33 6. Manufacturer's installation, operation and maintenance recommendations for
34 fixtures, equipment, valves and specialties.
35 7. Valve schedules
36 8. Warranties
37 9. Additional information as indicated in the technical specification sections
38

39 1.17 RECORD DRAWINGS
40

- 41 A. Refer to Division 01 of the Project Manual.
42
- 43 B. Maintain Record Drawings on daily basis to be turned over at completion of Project.
44

45 1.18 TESTING
46

- 47 A. Provide materials, labor, and equipment required for testing.
48
- 49 B. Notify Inspector(s) one day prior to the time when the test is ready to be performed.

- 1
2 C. After testing, submit in writing the time, date, name and title of the person approving
3 the test. This shall also include the description and what portion of the system has
4 been tested. The person approving the test shall sign the submittal.
5
6 D. Records shall be maintained of testing that has been completed, and shall be made
7 available at the job site.
8
9 E. Upon completion of the work, records and certifications approving testing
10 requirements shall be submitted.
11
12 F. Defective work or material shall be replaced or repaired, and the test repeated.
13 Repairs shall be made with new materials.
14

15 1.19 CLEANING

- 16
17 A. Keep the premises broom clean and free of surplus materials, rubbish and debris.
18
19 B. After fixtures and equipment have been installed, remove stickers, rust stains, labels,
20 and temporary covers.
21
22 C. Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers,
23 motors, devices, switches, fixtures, and panels.
24
25 D. Identification plates on equipment shall be free of paint and dirt.
26
27 E. Leave the work in a condition ready for operation.
28

29 1.20 WARRANTY

- 30
31 A. Warrant that work shall function for one year immediately following acceptance of
32 the system(s).
33
34 B. Keep the system in good working order at no expense, unless defects are clearly the
35 result of improper or abnormal usage.
36
37 C. Submit for acceptance of the work, written certification that the entire system has
38 been installed and adjusted for operation in accordance with the Contract Documents.
39
40

41 PART 2 PRODUCTS

42 2.1 ELECTRICAL REQUIREMENTS

- 43
44
45 A. General:
46 1. Work shall conform to requirements of Division 26.
47 2. Power wiring shall be provided by the EC. Control wiring shall be provided by
48 the PC. Plumbing Contractor shall provide wiring diagrams for use by the
49 Electrical Contractor.

1 2.2 ACCESS PANELS AND DOORS
2

- 3 A. Provide access panels at locations requiring access to mechanical equipment.
4 Locations include, but are not limited to areas above drywall ceilings, shaft enclosures
5 and other furred-in spaces concealing valves, ducts or equipment. Provide UL listed,
6 fire rated access panels when penetrating fire rated chase or shaft areas.
7
- 8 B. Access panels shall be of size required to provide adequate access to equipment.
9 Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for
10 body access.
11
- 12 C. Panels shall be Milcor brand or equivalent.
13
- 14 D. Panels shall include concealed hinges, cam type locking devices, and have
15 frame/border type necessary for particular wall or ceiling construction they are
16 installed. Access panels shall be flush mounted, recessed frame type units. Access
17 panels shall be prime coated steel, able to accept field painting for general
18 applications and stainless steel for use in toilet rooms, shower rooms and similar wet
19 areas.
20
- 21 E. Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and
22 finishes.
23
- 24 F. For non-security applications, panel construction shall utilize 16 gauge frame with not
25 less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for
26 panels in general location applications and shall be key locked for public area
27 applications.
28

29 2.3 PIPE PENETRATIONS
30

- 31 A. Refer to Division 01 requirements as well as the following.
32
- 33 B. Fire, Smoke And Fire/Smoke Rated Surfaces:
34 1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar,
35 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset
36 Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire
37 Seal Firestop Foam or Dow Corning Fire Stop System.
38 2. All fire stopping systems shall be provided by the same manufacturer.
39 3. UL listed or tested by independent testing laboratory, approved by State and
40 Local Code jurisdictions.
41 4. Use product that has a rating not less than rating of wall or floor being
42 penetrated. Reference architectural drawings for identification of fire and/or
43 smoke rated walls and floors.
44 5. Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless
45 fire stop material used includes a sleeve that is an integral part of rated assembly.
46
47
48 6. Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop
49 collars, firestop blocks, firestop mortar or a combination of these products to

1 provide a UL listed system for each application required for this project. Provide
2 mineral wool backing where specified in manufacturer's application detail.
3

4 C. Non-Rated Surfaces:

- 5 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling
6 plates for covering openings in occupied spaces.
7 2. In exterior wall openings below grade, use modular mechanical type seal
8 consisting of interlocking synthetic rubber links shaped to continuously fill the
9 annular space between the un-insulated pipe and cored opening or a water-stop
10 type wall sleeve.
11 3. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic,
12 Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116
13 urethane caulk to effect seal. Use galvanized sheet metal sleeves in hollow wall
14 penetrations.
15

16 2.4 EQUIPMENT, PIPING AND VALVE IDENTIFICATION
17

18 A. Equipment Labels:

- 19 1. After painting and covering, identify equipment, including pumps, tanks,
20 compressors, and control panels. Locate identification conspicuously.
21 2. Identification of equipment shall be by engraved white letters on a black 1/16
22 inch thick plastic laminate panel, beveled edges, screw mounting, permanently
23 attached to the equipment.
24

25 B. Minimum size:

- 26 1. 3/4" x 2 1/2" with 3/8" letters.
27

28 C. Manufacturers:

- 29 1. Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by
30 EMED Co., or equal by W. H. Brady.
31

32 D. Pipe Identification:

- 33 1. Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of
34 Piping Systems".
35 2. Printed labels identifying the fluid conveyed and direction of flow shall be
36 attached to pipes in accessible locations, at intervals not to exceed 20 feet, not
37 less than once in each room, at each branch, adjacent to each access door or
38 panel, at each valve and where exposed piping passes through walls and floors.
39

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1 1/4"	1/2"
1 1/2" to 2"	3/4"
2 1/2" to 6"	1 1/2"

40 3. Manufacturers:

- 41 a. EMED Co., Seton Name Plate Company, or W. H. Brady.
42
43

- 1 E. Stencils:
2 1. Not less than 1 inch high letters/numbers for marking pipe and equipment.
3
4 F. Valve Tags:
5 1. Identify each valve by means of 1½" diameter brass tag fastened to body of valve
6 with copper or brass chain. Identification number shall be stamped thereon with
7 letters a minimum of ½" high. System identification abbreviation shall be
8 stamped with letters a minimum of ¼" high.
9 2. The following prefixes shall be used:
10 a. PLBG - Plumbing
11 3. Manufacturers:
12 a. EMED Co., Seton Name Plate Company, or W. H. Brady.
13
14 G. Valve Charts:
15 1. Furnish three charts listing each valve. Two charts shall be delivered to A/E. An
16 additional chart shall be framed behind glass and hung in location selected by
17 Owner. Charts shall show the following:
18 a. Valve number
19 b. Size
20 c. Manufacturer
21 d. Type of valve
22 e. Type of service
23 f. Location
24 2. Furnish a typewritten chart indicating equipment or areas served by each
25 numbered valve and incorporate in Operating and Maintenance Manuals.
26

27 2.5 EQUIPMENT ACCESSORIES

- 28
29 A. Provide equipment accessories, connections, and incidental items.
30
31 B. Install piping connecting to pumps and other equipment without strain at the piping
32 connection. If requested by the A/E, remove the bolts in these flanged connections, or
33 disconnect piping, to demonstrate that piping has been properly connected.
34
35

36 PART 3 EXECUTION

37 3.1 GENERAL

- 38
39 A. Coordination Of Work:
40 1. Review the complete set of Drawings and Specifications and report discrepancies
41 to the A/E. Obtain written instructions for changes necessary. Coordinate with
42 each trade prior to beginning installation and make provisions to avoid
43 interferences. Changes required caused by neglect to coordinate shall be made
44 without expense to the project.
45 2. Piping shall not be located above electrical panels.
46
47 B. Anchor Bolts, Sleeves, and Supports:
48

- 1 1. These items required for the Work shall be furnished by the FPC for proper
2 installation of his work. They shall be installed (except as otherwise specified)
3 by the trade furnishing and installing the material in which they are to be located.
4 Location of anchor bolts, sleeves, inserts and supports shall be directed by the
5 trade requiring them. Expense resulting from the improper location or
6 installation of anchor bolts, sleeves, inserts and supports shall be paid for by the
7 Contractor for the trade with responsibility for directing their proper location.
8

9 C. Adjustments In Locations:

- 10 1. Locations of pipes and equipment, shall be adjusted to accommodate the work
11 interferences anticipated and encountered. Prior to fabrication determine the
12 exact route and location of each pipe (subject to A/E's approval).
13

14 D. Right Of Way:

- 15 1. New lines which pitch shall have the right-of-way over those which do not pitch.
16 For example: Gravity drains shall normally have right-of-way. Lines whose
17 elevations cannot be changed shall have the right-of-way over lines whose
18 elevations can be changed. Notify A/E and other trades of conflicts.
19 2. Offsets, transitions and changes in direction of electrical raceways, pipes, and
20 ducts shall be made to maintain proper room and pitch of sloping lines whether
21 or not indicated on the Drawings.
22

23 3.2 OPENINGS, CUTTING AND PATCHING

24 A. Refer to Division 01 of the Project Manual.

- 25
26 B. Provisions for openings including chases, holes and clearances through walls, floors,
27 and roof, ceilings and partitions shall be made in advance of construction of each part
28 of the building. Openings shall be provided by the GC for the respective materials in
29 which openings occur, during the construction of the building with the exception of
30 pipe sleeves. The PC shall furnish to the GC opening dimensions and locations.
31
32

- 33 C. If the PC neglects to inform the GC of his opening requirements before that portion of
34 the building construction is complete, the PC shall cut the openings and provide
35 framing and lintels. In the event holes must be cut through reinforced concrete, avoid
36 spalling and unnecessary damage or weakening of structural members. No chopping
37 or breaking out is permitted. Before cutting or drilling, obtain permission from the
38 A/E. Patch adjacent materials and repair damage resulting from the cutting.
39

- 40 D. The PC may perform core drilling for openings in existing walls and floors at the
41 direction of the A/E. Framed openings shall be by the GC.
42

- 43 E. Patch interior trench excavation to match existing slab-on-grade with concrete: 3500
44 PSI at 28 days, 3" slump, 3/4" maximum aggregate size, 5.5 bags of cement per cubic
45 yard.
46

1 3.3 BUILDING ACCESS
2

- 3 A. Arrange for necessary openings in building to allow for admittance of all apparatus.
4 When building access was not previously arranged and must be provided by
5 Contractor, restore opening to original condition after the apparatus has been brought
6 into building. Coordinate with Architect/Engineer.
7

8 3.4 EQUIPMENT ACCESS
9

- 10 A. Install piping, conduit, fixtures, and accessories to permit access to equipment for
11 maintenance. Coordinate exact location of wall and ceiling access panels and doors
12 with General Contractor, making sure access is available for equipment and
13 specialties. Where access is required in plaster walls or ceilings, furnish and install
14 access doors required. Coordinate for installation of access doors utilizing General
15 Contractor and other appropriate on-site subcontractor for access door installation.
16

- 17 B. Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color
18 coded thumb tacks or screws, depending on surface, for use in accessible ceilings.
19

20 3.5 COORDINATION OF WORK
21

- 22 A. Install systems, equipment and piping in cooperation with other trades. Locations of
23 pipes, equipment, fixtures, etc., shall be adjusted to accommodate the work
24 interferences anticipated and encountered. Prior to fabrication determine the exact
25 route and location of each pipe (subject to A/E's approval).
26

- 27 B. Any work that is not coordinated and that interferes with other contractor's work shall
28 be removed or relocated at the installing contractor's expense.
29

- 30 C. Verify that all devices are compatible for the type of construction and surfaces on
31 which they will be used.
32

- 33 D. Offsets, transitions and changes in direction of electrical raceways, pipes and ducts
34 shall be made as required to maintain proper room and pitch of sloping lines whether
35 or not indicated on the Drawings. Furnish and install all traps, air vents, sanitary
36 vents, etc., as required to effect the offsets, transitions and changes in direction.
37

- 38 E. New lines which pitch shall have the right-of-way over those which do not pitch. For
39 example: Gravity drains shall normally have right-of-way. Lines whose elevations
40 cannot be changed shall have the right-of-way over lines whose elevations can be
41 changed. Notify A/E and other trades of any conflicts.
42

- 43 F. Provide appropriate sections of work with required wall, roof and floor opening
44 locations and dimensions. If Contractor neglects to coordinate information, openings
45 shall be the responsibility of Contractor.
46
47

1 3.6 PIPING INSTALLATION
2

3 A. General:

- 4 1. Expansion and contraction of piping shall be provided for by expansion loops,
5 bends, swing joints, or expansion joints to prevent damage to connections,
6 piping, and equipment of the building.
7 2. Unions or flanges shall be installed on all by-passes, ahead of all traps, adjacent
8 to screw connection valves, and at all connections to equipment, whether or not
9 shown on drawings.

10
11 B. Installation Arrangement:

- 12 1. Install all Work to permit removal (without damage to other parts) of all parts
13 requiring periodic replacement or maintenance. Arrange pipes and equipment to
14 permit ready access to valves, cocks, traps, starters, motors, control components
15 and to clear the openings of swinging and overhead doors and of access panels.
16

17 C. Connections Different From Those Shown:

- 18 1. Where equipment requiring different arrangement or connections from those
19 shown is used, install the equipment to operate properly and in harmony with the
20 intent of the Drawings and Specifications. When requested by the A/E, submit
21 drawings showing the proposed installation.
22 2. If the proposed installation is approved, make all incidental changes in piping,
23 ductwork, supports, insulation, wiring, panelboards, etc. Provide any additional
24 motors, controllers, valves, fittings and other additional equipment required for
25 the proper operation of the system resulting from the selection of equipment,
26 including all required changes in affected trades. The Contractor shall be
27 responsible for the proper location of rough-in and connections by other trades.
28 3. All changes shall be made at no increase in the Contract amount or additional
29 cost to the other trades.
30

31 3.7 SLEEVES
32

33 A. Provide galvanized sheet metal sleeves for pipe penetrations through interior and
34 exterior walls to provide a backing for sealant or firestopping. Patch wall around
35 sleeve to match adjacent wall construction and finish. Grout area around sleeve in
36 masonry construction. In finished spaces where pipe penetration through wall is
37 exposed to view, sheet metal sleeve shall be installed flush with face of wall. In
38 existing poured concrete walls where penetration is core drilled, pipe sleeve is not
39 required.
40

41 B. Pipe sleeves are not required in existing poured concrete walls where penetrations are
42 core drilled.
43

44 C. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe
45 (sized to allow insulated pipe to run through sleeve), cast in place.
46
47
48

- 1 D. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend
2 1 inch above the adjacent finished floor. In existing floor penetrations, core drill
3 sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve
4 with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported
5 by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will
6 transfer weight to existing floor structure.
7
- 8 E. For floor penetrations through existing floors in mechanical and wet locations listed
9 below, core drill opening and provide 1-1/2" x 1-1/2" x 1/8" galvanized steel angles
10 fastened to floor surrounding the penetration or group of penetrations to prevent water
11 from entering the penetration. Provide urethane caulk between angles and floor and
12 fasten angles to floor a minimum of 8" on center. Seal corners water tight with
13 urethane caulk. Or, core drill sleeve openings large enough to insert schedule 40
14 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement.
15
- 16 F. Pipe sleeves are not required in cored floor pipe penetrations through existing floors
17 that are not located in mechanical rooms, food service areas or wet locations listed
18 above.
19

20 3.8 PIPE PENETRATIONS

- 21
- 22 A. General:
- 23 1. Coordinate location of building surface penetrations with appropriate contractors.
24 Furnish sleeves, inserts, and devices to be built into structure to contractor
25 performing Work. Prepare Shop Drawings for approval for penetrations of
26 structural elements, including floor slabs, shear walls, and bearing walls. Do not
27 allow penetrations to be made until Shop Drawings are approved.
28
- 29 B. Fire Rated Surfaces:
- 30 1. Install products in accordance with the manufacturer's instructions where pipe
31 penetrates a fire rated surface. When pipe is insulated, use product that maintains
32 integrity of insulation and vapor barrier. Where sleeve must be installed in
33 existing floor, grout area around sleeve to restore floor integrity. In wet area floor
34 penetration, top surface of penetration to be 2 inches above adjacent floor with
35 additional height obtained by means of concrete pad poured integral with floor.
36
- 37 C. Non-Rated Surfaces:
- 38 1. Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated
39 surfaces in occupied spaces. Size units to accommodate insulation, where
40 applicable. Escutcheons are not required when insulation completely covers wall
41 opening and insulation end is trimmed in a neat manner. Occupied spaces for this
42 Paragraph include only those rooms with finished ceilings and penetration occurs
43 below ceiling.
- 44 2. In exterior wall openings below grade, place water-stop type wall sleeve before
45 concrete pour or core drill opening after pour. Assemble rubber links to proper
46 size for pipe and tighten in place in accordance with manufacturer's instructions.
- 47 3. Install galvanized sheet metal sleeve in hollow wall penetrations to provide
48 backing for sealant. Apply sealant to both sides of penetration in a manner that
49 annular space between pipe sleeve and pipe or insulation is completely blocked.

1 4. Completely seal (or caulk) around pipe penetrations through non-rated, smoke
2 tight corridor walls in healthcare facilities. Refer to architectural drawings for
3 additional information.
4

5 D. Completely seal pipe penetrations, as specified below, for walls of the following
6 rooms below:

- 7 1. Non-fire rated mechanical rooms
- 8 2. Isolation rooms
- 9 3. Computer rooms
- 10 4. Private offices

11 12 3.9 ESCUTCHEON PLATES

13
14 A. Provide plates on pipes passing through finished floors, walls and ceilings, with
15 outside diameter to cover sleeve opening and inside diameter to fit snugly around
16 pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.
17

18 3.10 PAINTING

19 A. Refer to Division 09.

20
21 B. All exposed steel support structures (all metal surfaces located both inside and outside
22 the building) shall be painted after installation with one coat of a compatible metal
23 primer coat and two coats of a finish coat of paint for the application. Color shall be
24 gray unless otherwise specified.
25
26

27 3.11 IDENTIFICATION

28
29 A. Identify equipment in mechanical equipment rooms by stenciling equipment number
30 and service with one coat of black enamel against a light background or white enamel
31 against a dark background. Use a primer where necessary for proper paint adhesion.
32

33 B. Where stenciling is not appropriate for equipment identification, engraved name plates
34 may be used.
35

36 C. Identify interior piping not less than once every 30 feet, not less than once in each
37 room, adjacent to each access door or panel, and on both side of the partition where
38 accessible piping passes through walls or floors. Place flow directional arrows at each
39 pipe identification location. Use one coat of black enamel against a light background
40 or white enamel against a dark background.
41

42 D. Identify all exterior buried piping for entire length with underground warning tape
43 except for sewer piping which is routed in straight lines between manholes or
44 cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend
45 tape to surface at building entrances, meters, hydrants and valves. Where existing
46 underground warning tape is broken during excavation, replace with new tape
47 identifying appropriate service and securely spliced to ends of existing tape.
48

- 1 E. Identify valves with brass tags bearing a system identification and a valve sequence
2 number. Identify medical gas and vacuum valves with brass tags and wall or cabinet
3 mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff
4 Valve for (Location or Zone)". Valve tags are not required at a terminal device unless
5 the valves are greater than ten feet from the device, located in another room or not
6 visible from device. Provide a typewritten valve schedule and pipe identification
7 schedule indicating the valve number and the equipment or areas supplied by each
8 valve and the symbols used for pipe identification; locate schedules in mechanical
9 room and in each Operating and Maintenance manual. Schedule in mechanical room
10 to be framed under clear plastic.

11
12
13

END OF SECTION

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SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- B. Section 22 05 00 – Common Work Results for Plumbing
- C. Section 22 07 00 – Plumbing Insulation
- D. Section 22 11 00 – Facility Water Distribution
- E. Section 22 13 00 – Facility Sanitary Sewerage

1.2 SCOPE

- A. This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:
 - 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Reference Standards
 - d. Quality Assurance
 - e. Design Criteria
 - f. Submittals
 - 2. PART 2 PRODUCTS
 - a. Manufacturers
 - b. Pipe Hangers and Supports
 - c. Pipe Hanger Rods
 - d. Beam Clamps
 - e. Riser Clamps
 - f. Concrete Inserts
 - g. Wood Structure Parts
 - h. Anchors
 - i. Equipment Support
 - 3. PART 3 EXECUTION
 - a. Installation
 - b. Structural Supports
 - c. Hanger and Support Spacing
 - d. Riser Clamps
 - e. Concrete Inserts
 - f. Anchors

1 1.3 REFERENCE STANDARDS

2
3 A. MSS SP-58

4
5 B. MSS SP-69

6
7 1.4 QUALITY ASSURANCE

8
9 A. Refer to Division 01, of the Project Manual.

10
11 1.5 DESIGN CRITERIA

12
13 A. Materials and application of pipe hangers and supports shall be in accordance with
14 MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

15
16 B. Piping connected to pumps, compressors, or other rotating or reciprocating equipment
17 is to have vibration isolation supports for a distance of one hundred pipe diameters or
18 three supports away from the equipment, whichever is greater. Standard pipe
19 hangers/supports as specified in this section are required beyond the 100 pipe
20 diameter/3 support distance.

21
22 C. Do not hang any mechanical item directly from a metal deck or run piping so its rests
23 on the bottom chord of any truss or joist.

24
25 D. General:

- 26 1. Secure pipe in place to prevent vibration, maintain proper slope and provide for
27 expansion and contraction.
- 28 2. Design supports of strength and rigidity to suit loading, service, and manner
29 which do not unduly stress the building construction. Where support is from
30 concrete construction, take care not to weaken concrete or penetrate
31 waterproofing. Fasten supports and hangers to building steel framing wherever
32 practical. Do not use another pipe for support. Do not use perforated iron, chain
33 or wire as hangers.
- 34 3. Use inserts for suspending hangers from reinforced concrete slabs wherever
35 practical. Where inserts are not practical, provide channels or angles from which
36 to suspend hangers/supports. Fasten structural steel to concrete with expansion
37 bolts.
- 38 4. Provide expansion anchors in concrete slabs for installation of threaded support
39 rods.
- 40 5. Provide hangers capable of vertical adjustment after piping is erected. Do not
41 pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts
42 to rods, peen threads, or provide double set of nuts with lock washers to prevent
43 loosening. Use beam clamps for attaching hangers to structural steel.
- 44 6. On piping insulated with vapor barrier covering, use protection shield to cover
45 bottom one-half of insulated pipe. Shield to be a minimum of 12" long and of 16
46 gauge galvanized steel.
- 47 7. Exception:
- 48 a. For insulated drain pipe, the pipe may rest on the hanger and the insulation
49 to wrap around the hanger and pipe.

- 1 8. Submit anchor drawings for approval upon request.
2 9. Hangers, supports, and support methods other than those specified shall not be
3 used without obtaining approval on method of support by the Structural Engineer
4 prior to installing piping systems. Submit support method arrangement, pipe
5 weight and spacing scheme for approval.
6
7 E. Hanger and Support Spacing:
8 1. Install hangers to provide minimum 1/2 inch space between finished covering
9 and adjacent work.
10 2. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or
11 similar piping specialty item.
12 3. Use hangers with 1-1/2 inch minimum vertical adjustment.
13 4. Where several pipes can be installed in parallel and at the same elevation,
14 provide multiple or trapeze hangers.
15 5. Support riser piping independently of connected horizontal piping.
16 6. Adjust hangers to obtain the slope specified in the piping section of these
17 specifications.
18
19 F. Space hangers for pipe as follows:
20

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Copper	1/2" through 3/4"	5'-0"	10'-0"
Copper	1" through 1-1/4"	6'-0"	10'-0"
Copper	1-1/2" through 2-1/2"	8'-0"	10'-0"
Steel	1/2" through 1-1/4"	7'-0"	15'-0"
Steel	1-1/2" through 6"	10'-0"	15'-0"
Plastic	Drain and Vent	4'-0"	10'-0"

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1.6 SUBMITTALS

- A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.
- B. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.
- C. Submit anchor drawings to the A/E for approval upon request.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. B-Line, Fee and Mason, Grinnell, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology, Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.

1 2.2 PIPE HANGERS AND SUPPORTS

2
3 A. Overhead Supports:

- 4 1. Adjustable clevis hanger, steel, Dura-Green epoxy coating or electro-plated, B-
5 Line Figure B3100.
6 2. Adjustable J hook hanger, steel, Dura-Green epoxy coating or electro-plated, B-
7 Line figure B3690.
8 3. Adjustable band hanger, steel, Dura-Green epoxy coating or electro-plated, B-
9 Line Figure B3172.

10
11 B. Multiple or Trapeze Hangers:

- 12 1. Where several pipes are running parallel and pitching in the same direction, strut
13 style support may be used. Steel channel, 12-gauge thickness, Dura-Green epoxy
14 coating or electro-plated, B-Line B11. Restrain individual pipes with B-Line
15 B2000 series or Vibraclamp series strut clamps.

16
17 C. Wall Support:

- 18 1. Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194
19 Series.
20 2. Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely
21 anchored to wall structure, with interlocking, split-type, bolt secured, galvanized
22 pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Grinnell
23 type PS 200 H with PS 1200 clamps.
24 3. When copper piping is being supported, provide flexible
25 elastomeric/thermoplastic isolation cushion material to completely encircle the
26 piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra
27 Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT
28 series, Grinnell PS 1400 series.

29
30 D. Vertical Support:

- 31 1. Riser clamp, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure
32 B3373.
33 2. Riser clamp, flexible sleeve with stainless steel band, Proset PS #33.

34
35 E. Floor Support:

- 36 1. Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.
37

38 F. Copper Pipe Supports:

- 39 1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be
40 copper plated or polyvinylchloride coated. Where steel channels are used,
41 provide isolation collar between supports/clamps/fasteners and copper piping.
42

43 2.3 PIPE HANGER RODS

44
45 A. Steel Hanger Rods:

- 46 1. Steel, electro-plated, threaded both ends, threaded one end, or continuous
47 threaded, complete with adjusting and lock nuts. B-Line B3205.
48 2. Size rods for individual hangers and trapeze support as indicated in the following
49 schedule:

- 1 3. Total weight of equipment, including valves, fittings, pipe, pipe content, and
2 insulation, are not to exceed the limits indicated.
3

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

4
5 2.4 BEAM CLAMPS
6

- 7 A. MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange
8 to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch
9 diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034,
10 Grinnell 86/92.
11
12 B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock
13 clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell
14 228.
15

16 2.5 CONCRETE INSERTS
17

- 18 A. Poured in Place:
19 1. MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body
20 with a removable malleable iron nut that accepts threaded rod to 7/8 inch
21 diameter. Wedge design to allow the insert to be held by concrete in
22 compression to maximize the load carrying capacity. B-Line B2505, Grinnell
23 281.
24 2. MSS SP-69 Type 18 universal type to be constructed of black malleable iron
25 body with a removable malleable iron nut that accepts threaded rod to 7/8 inch
26 diameter. B-Line B3014N, Grinnell 282.
27
28 B. Drilled Fasteners:
29 1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc
30 plating, minimum tension load of 3200 pounds. Use drill bit of same
31 manufacturer as anchor.
32
33 C. Manufactured By:
34 1. Hilti, Powers/Rawl, Redhead.
35

36 2.6 WOOD STRUCTURE SUPPORTS
37

- 38 A. Carbon steel pipe short strap for piping 1/2" through 2". Fastened with two No. 24 x 2
39 (minimum size) wood screws. Anvil Figure 262.
40
41 B. Carbon steel coach screw rods machine threaded on opposite ends, minimum 3/8"
42 diameter. Anvil Figure 142.

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C. Carbon steel side beam bracket with minimum 3/8" rod size and fastened with minimum 1/2" x 3" lag screws. Anvil Figure 207.

2.7 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.8 EQUIPMENT SUPPORT

A. Examine Drawings, and manufacturer's data to determine how equipment, fixtures, and piping are to be supported, mounted or suspended. Support all equipment plumb, rigid, and true to line. Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

B. Equipment Stands:

1. 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.

PART 3 EXECUTION

3.1 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.

1 3.2 STRUCTURAL SUPPORTS
2

- 3 A. Provide all supporting steel required for the installation of mechanical equipment and
4 materials, including angles, channels, beams, etc. to suspended or floor supported
5 tanks and equipment. All of this steel may not be specifically indicated on the
6 drawings.
7

8 3.3 RISER CLAMPS
9

- 10 A. Support vertical piping with clamps secured to the piping and resting on the building
11 structure or secured to the building structure below at each floor.
12

13 3.4 CONCRETE INSERTS
14

- 15 A. Select size based on the manufacturer's stated load capacity and weight of material
16 that will be supported. Use inserts for suspending hangers from reinforced concrete
17 slabs and sides of reinforced concrete beams. Provide hooked rod to concrete
18 reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs
19 form finished ceiling, provide inserts that are flush with the slab surface.
20

21 3.5 ANCHORS
22

- 23 A. Install where indicated on the drawings and details. Where not specifically indicated,
24 install anchors at ends of principal pipe runs and at intermediate points in pipe runs
25 between expansion loops. Make provisions for preset of anchors as required to
26 accommodate both expansion and contraction of piping.
27
28

29

END OF SECTION

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SECTION 22 07 00

PLUMBING ISULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- 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

1.2 SCOPE

- A. This Section includes insulation specifications for plumbing systems. Included are the following requirements:
 - 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Description
 - d. Quality Assurance
 - e. Definitions
 - f. Submittals
 - 2. PART 2 PRODUCTS
 - a. Acceptable Manufacturers
 - b. Insulation and Jackets
 - 3. PART 3 EXECUTION
 - a. General
 - b. Installation
 - c. Pipe Insulation Schedule

1.3 DESCRIPTION

- A. Furnish and install insulating materials, fittings, finishes, and accessories specified for piping and related equipment. The following types of insulation are specified in this Section:
 - 1. Pipe insulation
- B. Install insulation materials 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 Engineer.

1 1.4 QUALITY ASSURANCE
2

- 3 A. Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project
4 Manual.
5
6 B. Label insulating products delivered to construction site with the manufacturer's name
7 and description of materials.
8

9 1.5 DEFINITIONS
10

- 11 A. Concealed: Shafts, furred spaces, space above finished ceilings, utility tunnels and
12 crawl spaces. Other areas, including walk-through tunnels, shall be considered as
13 exposed.
14
15 B. Exposed to weather: Located outdoors, either on grade, on a wall, or on a roof, in
16 location where sun, wind, rain, snow and other elements will come in contact with it.
17
18 C. Unconditioned spaces: Unheated or non-cooled attics, utility tunnels and crawl spaces
19 where ambient temperatures may rise above 90 degrees F, or drop below 50 Degrees F.
20 Ducts in these instances are considered to be located outside of building thermal
21 envelope.
22

23 1.6 SUBMITTALS
24

- 25 A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project
26 Manual
27
28 B. Include manufacturer's data for the following:
29 1. Pipe insulation
30
31 C. Submittal shall include the following information:
32 1. Manufacturer's technical data sheets for each product with the following
33 information:
34 a. Density
35 b. Thermal characteristics
36 c. Temperature limitations
37 d. Jacket type
38 e. Materials of composition
39 f. Material safety data sheets
40 2. Schedule of all insulating materials to be used including:
41 a. Application / intended use of each insulation type
42 b. Insulation type and thickness
43 c. Jacket type
44 d. Fastening methods and adhesive type
45
46

1 PART 2 PRODUCTS

2
3 2.1 ACCEPTABLE MANUFACTURERS

- 4
5 A. Armstrong, Halstead, Johns-Manville, Knauf, or Owens-Corning.

6
7 2.2 INSULATION AND JACKETS

8
9 A. Glass Fiber:

- 10 1. Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible, "K"
11 Value: 0.23 at 75°F, maximum service temperature: 850°F, with vapor Retarder
12 Jacket: AP-T Plus White Kraft paper reinforced with glass fiber yarn and bonded
13 to aluminum foil, secure with self-sealing longitudinal laps and butt strips or AP
14 Jacket with outward clinch expanding staples or vapor barrier mastic as needed.

15
16
17 PART 3 EXECUTION

18
19 3.1 GENERAL

- 20
21 A. Application of insulation to piping equipment shall be done in accordance with the
22 manufacturer's installation recommendations. Where thickness of insulation is not
23 specified, use thickness recommended by manufacturer or required by applicable
24 Codes.
- 25
26 B. Insulation shall be applied in as warm an environment as possible, and in no instance
27 below 25°F.
- 28
29 C. No pipe shall be covered until after it has been installed, inspected, tested and
30 approved.

31
32 3.2 INSTALLATION

- 33
34 A. All pipe insulation shall be installed with joints butted firmly together. All valves and
35 fittings shall be insulated with mitered sections of insulation equal in density and
36 thickness to the adjoining insulation, or with insulating cement equal in thickness to
37 the adjoining insulation, or with "Zeston" type, premolded PVC fittings installed in
38 accordance with the manufacturer's instructions. Fittings are to be finished with 8 oz.
39 glass mesh and mastic (use breather mastic on systems operating above 50°F except
40 where Zeston PVC covers are used). Jackets on pipe insulation may be stapled using
41 outward clinch staples spaced 3" apart at least ¼" in from the lap edge on systems
42 operating at 60°F and above; below 50°F the laps are to be vapor sealed using self-
43 sealing lap, lap-seal tape gun or adhesive such as Armstrong 520. All insulation ends
44 are to be tapered and sealed regardless of service.

- 1 B. On all piping insulated with vapor barrier covering, use protection shield to over
2 bottom one-half of insulated pipe. Shield to be minimum of 12" long and 16 gauge
3 galvanized steel. Provide half-round, 12" long, hanger block at the bottom half of the
4 pipe in place of the fiberglass pipe insulation. The hanger blocks shall be molded
5 cork or calcium silicate pipe insulation of the same thickness as the adjoining
6 fiberglass pipe insulation. The vapor barrier jacket shall be continuous through the
7 hanger location.
8
9 C. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe
10 hangers shall be sized large enough to be installed over the outer surfaces of the
11 insulation.
12
13 D. Exception:
14 1. For insulated drain pipe, the pipe may rest directly on the hanger and the
15 insulation to wrap around the hanger and pipe.
16
17 E. Omit insulation for:
18 1. Unions and flanges.
19 2. Vents to atmosphere, discharges from safety and relief valves and drain pipes.
20
21 F. Provide finished edges at all access doors and end.
22

23 3.3 PIPE INSULATION SCHEDULE
24

- 25 A. Provide insulation on new and remodeled piping.
26
27 B. Minimum Insulation Thickness:
28

SYSTEMS	PIPE SIZE			
	1" or less	1-1/4" to 2"	2-1/2" to 4"	5" and up
Domestic Cold Water	1/2"	1/2"	1"	1"
Domestic Hot Water	1"	1"	1-1/2"	1-1/2"
Domestic Hot Water Return	1"	1"	1-1/2"	---

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END OF SECTION

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SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- B. 22 05 00 – Common Work Results for Plumbing
- C. 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.2 SCOPE

- A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:
 - 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Description
 - d. Quality Assurance
 - e. Submittals
 - 2. PART 2 PRODUCTS
 - a. Water Distribution Pipe and Fittings
 - b. Valves
 - c. Unions and Flanges
 - d. Dielectric Couplings
 - e. Water Hammer Suppressors
 - 3. PART 3 EXECUTION
 - a. Water Piping System
 - b. Testing

1.3 DESCRIPTION

- A. Provide a domestic water distribution system including hot and cold water supply piping, hot water return piping, tempered water piping, pure water piping, valves, fittings, hardware, and specialties. Connect to plumbing fixtures, specialties, and equipment.

1.4 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

1 B. Order all pipe with each length marked with the name or trademark of the
2 manufacturer and type of pipe; with each shipping unit marked with the purchase
3 order number, metal or alloy designation, temper, size, and name of supplier.
4

5 C. Any installed material not meeting the specification requirements must be replaced
6 with material that meets these specifications without additional cost to the Owner.
7

8 D. To assure uniformity and compatibility of piping components in grooved piping
9 systems, all grooved products utilized shall be supplied by a single manufacturer.
10 Grooving tools shall be supplied from the same manufacturer as the grooved
11 components.
12

13 1.5 SUBMITTALS

14
15 A. Submit valve product data sheets in accordance with Section 22 05 00 and Division 01
16 of the Project Manual.
17

18 B. Include materials of construction, dimensional data, ratings/capacities/ranges,
19 approvals, test data, and identification as referenced in this section and/or on the
20 drawings.
21

22 PART 2 PRODUCTS

23 2.1 WATER DISTRIBUTION PIPE AND FITTINGS

24
25
26 A. Under Ground:

27 1. 2" and Smaller:

28 a. Copper tube, type K, soft temper, ASTM B88, with wrought copper fittings.
29 ANSI B16.22. Join using lead free flux and solder, ASTM B32, flux ASTM
30 B813.
31

32 2. 3" and Larger:

33 a. Ductile iron pipe, mechanical or push on joint, thickness class 53
34 conforming to AWWA C-151 with standard thickness cement mortar lining
35 AWWA C-104; ductile iron or gray iron mechanical joint cement mortar
36 lined fittings, Class 250, AWWA C110; ductile iron restrained joint
37 compact fittings, class 350, AWWA C-153; rubber gasket joints with non-
38 toxic gasket lubricant, AWWA C-111. Joints shall have ASTM A506 steel
39 clamps and straps for restraints with ASTM A307 steel bolts and ASTM
40 A575 steel rods. Provide 8-mil tube or sheet polyethylene encasement of
41 iron pipe and pipe fittings, AWWA C105.
42

43 B. Above Ground:

44 1. Copper tube, Type L, hard temper, ASTM B88; with wrought copper fittings,
45 ANSI B16.22. Join using lead free flux, ASTM B813, and solder, ASTM B32.
46
47
48

- 1 2. Wrought copper, ANSI B16.22 or cast bronze, ANSI B16.18 fittings, copper tube
2 dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is
3 not permitted), joined with mechanical couplings, synthetic rubber gasket seal,
4 Victaulic style 607 QuickVic™ Installation Ready stab-on design, for direct
5 ‘stab’ installation onto roll grooved copper tube without prior field disassembly
6 and no loose parts.
7

8 2.2 VALVES
9

10 A. Manufacturer:

- 11 1. Valves throughout the project shall be by one manufacturer, unless otherwise
12 specified.
13

- 14 B. Standard valves are based on Nibco models. Equivalent style valves as manufactured
15 by Apollo, Crane, DeZurik, Gustin-Bacon, Grinnell, Hammond, Jenkins,
16 Lunkenheimer, Milwaukee Valve, Stockham, Victaulic, or Watts are acceptable.
17 Valves shall be of standard dimensions, comparable to the number specified.
18

19 C. Shutoff Valves:

- 20 1. Except as otherwise specified, all shutoff valves 2-1/2 inch and smaller shall be
21 ball valves and shutoff valves 3 inch and larger shall be butterfly valves, unless
22 required otherwise by local Water Utility specifications.
23

24 D. Ball Valves:

- 25 1. Bronze, two piece full port ball valves with bronze body, solder or threaded ends,
26 chromium plated brass or stainless steel ball, reinforced Teflon seats and seals,
27 blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-
28 585-70. Include handle extension for insulated piping, NIB-SEAL by Nibco.
29 2. Bronze, two piece full port ball valves with bronze body, solder or threaded ends,
30 stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design,
31 rated at 600 PSI non-shock WOG, Nibco model T/S-585-70-66. Include handle
32 extension for insulated piping, NIB-SEAL by Nibco.
33 3. Bronze, three piece full port ball valves with bronze body, solder or threaded
34 ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem
35 design, rated at 600 PSI non-shock WOG, Nibco model T/S-595-66. Include
36 handle extension for insulated piping, NIB-SEAL by Nibco.
37

38 E. Check Valves:

- 39 1. 3” and Smaller:
40 a. Bronze body, Class 125, Y-pattern, swing type, check valve with solder
41 ends, all bronze internal components and renewable seat and disc, Nibco
42 model S-413-B.
43 2. 2” and Smaller:
44 a. Bronze body, ASTM B62, in-line lift type, spring, Buna-N disc, 250 psig
45 WOG rating. Nibco 480.
46
47

1 2.3 UNIONS AND FLANGES
2

3 A. Unions:

- 4 1. Bronze, solder connection, Nibco figure 733.
5

6 B. Flanges:

- 7 1. Cast copper alloy, class 125, MSS SP-106, Nibco figure 741.
8

9 2.4 DIELECTRIC COUPLINGS
10

- 11 A. Steel casing, zinc electroplated, with inert thermoplastic lining, various end types,
12 Clearflow, style 47 by Victaulic.
13

- 14 B. Dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or
15 brass female pipe thread end connections, non-asbestos gaskets and pressure rating of
16 not less than 175 psig at 180 degrees Fahrenheit. Watts Regulator Company,
17 Lochinvar, Wilkins, Epco Sales, Inc.
18

19 2.5 WATER HAMMER SUPPRESSORS
20

- 21 A. Acceptable manufacturers are MIFAB, PPP, Sioux Chief, and Watts.
22

- 23 B. Piston compressed air column type, with sealed air chamber.
24

- 25 C. Water supply piping serving fixtures, appliances, equipment and devices with quick
26 closing and/or solenoid-actuated valves shall be provided with water hammer
27 arrestors. Also provide where indicated on the water supply piping as shown on the
28 water supply isometrics. Devices shall be mechanical arrestors installed in
29 accordance with PDI Standard WH201. Air chambers are not considered to be equal.
30

- 31 D. Shop drawings are required. Submit to A/E for approval prior to installation.
32

- 33 E. Water hammer arrestors must be accessible for inspection and replacement. Provide
34 access panel.
35
36

37 PART 3 EXECUTION
38

39 3.1 WATER PIPING SYSTEM
40

- 41 A. Piping shall be pitched to drain entire system; install drain valves at low points.
42 Provide unions at equipment and valves. Provide offsets and transition fittings as
43 required. Avoid dips or depressions in pipe runs.
44

- 45 B. No water piping shall be installed in exterior walls, unless adequately protected from
46 freezing. Two inch insulation shall be installed on back and sides of chase, front shall
47 be open to room heat, covered only by finished wall material.
48

- 1 C. Install unions, couplings, or flanges at all final equipment connections and as required
2 to facilitate removal of equipment.
3
- 4 D. Install dielectric couplings at every connection between copper pipe and other metals.
5 Use dielectric unions for connecting copper and steel piping.
6
- 7 E. Provide backflow devices as required by Code on water connections to HVAC
8 equipment and other equipment.
9
- 10 F. Hot water and cold water lines shall be kept at least 6 inches apart whenever possible.
11
- 12 G. Valve Installation:
13 1. Install shutoff valves with stem vertical. Exception; the stem may be horizontal
14 if a vertical installation would not allow access to the valve handle.
15 2. All valves with screwed ends shall be installed using "Teflon" tape applied on
16 male portion of piping fitting.
17 3. Each individual fixture or piece of equipment shall have an independent shut-off
18 valve adjacent to fixture in addition to the required branch shut-off. Where
19 valves are installed in walls an access panel shall be provided.
20
- 21 H. Branches:
22 1. Valve shut-off full size of branch for each branch take-off to supply stack or
23 fixture group.
24
- 25 I. Drains:
26 1. Provide valved drains at low points of systems as required or directed. All piping
27 shall be arranged to drain through valved drains.
28
- 29 J. Flushing Mains and Branch Piping:
30 1. Upon completion of the water distribution system, test all valves to insure their
31 full opening and flush out the system progressively by opening drain valves and
32 building outlets and permitting the flow to continue from each until the water
33 runs clear.
34
- 35 K. Pipe Insulation:
36 1. Provide pipe insulation for all domestic water piping per Section 22 07 00.
37
- 38 L. Sterilization of Water Distribution System:
39 1. As soon as the water distribution system has been flushed out as above specified,
40 it shall be sterilized in accordance with the requirements of the local Health
41 Department/Water Utility or in the absence of such, by the following method:
42 a. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling
43 the lines slowly and applying the sterilizing agent at a rate of 50 parts per
44 million of chlorine, as determined by residual chlorine tests at the ends of
45 the lines. Open and close all valves and hydrants while the system is being
46 chlorinated.
47 b. After the sterilizing agent has been applied for 24 hours, test for residual
48 chlorine at the ends of the lines. If less than 5 PPM as indicated, repeat the
49 sterilization process.

1 c. When tests show at least 5 PPM of residual chlorine flush out the system
2 until all traces of the chemical used are removed.

3 2. Samples:

4 a. After disinfecting the water distribution system, take water samples to check
5 for bacteria. Take 5 water samples from remote faucets, plus the main
6 entrance. Send the samples to the Local Department of Health Lab to
7 sample for a safe water supply system.

8
9 3.2 TESTING

10 A. Refer to Division 01, "Starting of Systems" and Section 22 05 00.

11
12
13 B. Hydro-statically pressure test water piping to 150 psig for 4 hours. No decrease in
14 pressure is allowed. Provide pressure gauge with shutoff and a bleeder valve at the
15 highest point of the system tested. Inspect joints in system under test. No leaks
16 allowed.

17
18 C. Do not conceal pipe until satisfactorily tested.

19
20 D. Testing with air will not be allowed.

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END OF SECTION

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SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- B. 22 05 00 – Common Work Results for Plumbing
- C. 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.2 SCOPE

- A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:
 - 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Description
 - d. Quality Assurance
 - e. Submittals
 - 2. PART 2 PRODUCTS
 - a. Underground Pipe Fittings
 - b. Above Ground Pipe and Fittings
 - c. Drains and Cleanouts
 - 3. PART 3 EXECUTION
 - a. Drain and Vent Piping System
 - b. Pipe Joints
 - c. Safings
 - d. Vent Flashing
 - e. Cleanouts
 - f. Traps
 - g. Testing

1.3 DESCRIPTION

- A. Interior sanitary waste and vent and acid drain and vent piping systems including branches, drains, cleanouts, stacks, fittings and hardware.
- B. Work under this section shall commence from 5 feet outside the building wall with connections to sanitary building sewer lateral(s).

1 1.4 QUALITY ASSURANCE
2

- 3 A. Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project
4 Manual.
5
6 B. Order all pipe with each length marked with the name or trademark of the
7 manufacturer and type of pipe; with each shipping unit marked with the purchase
8 order number, metal or alloy designation, temper, size, and name of supplier.
9
10 C. Any installed material not meeting the specification requirements must be replaced
11 with material that meets these specifications without additional cost to the Owner.
12

13 1.5 SUBMITTALS
14

- 15 A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project
16 Manual.
17
18 B. Schedule from the contractor indicating the ASTM, or CISPI specification number of
19 the pipe being proposed along with its type and grade, and sufficient information to
20 indicate the type and rating of fittings for each service.
21
22 C. Include materials of construction, dimensional data, ratings/capacities/ranges,
23 approvals, test data, and identification as referenced in this section and/or on the
24 drawings.
25
26

27 PART 2 PRODUCTS
28

29 2.1 UNDERGROUND PIPE AND FITTINGS
30

- 31 A. Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket
32 couplings, ASTM C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall
33 be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive
34 prior approval of the engineer. Piping and fittings shall be manufactured by AB&I,
35 Charlotte, or Tyler.
36
37 B. Cast iron soil pipe, bell and spigot, service weight, coated, ASTM A74, with rubber
38 gaskets, ASTM C564. Pipe and fittings shall be marked with the collective trademark
39 of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping
40 and fittings shall be manufactured by AB&I, Charlotte, or Tyler.
41
42 C. PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM
43 D-2665, with solvent weld joints, ASTM D2855. Solid wall PVC only.
44
45
46

1 2.2 ABOVE GROUND PIPE AND FITTINGS
2

- 3 A. Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket
4 couplings, ASTM C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall
5 be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive
6 prior approval of the engineer. Piping and fittings shall be manufactured by AB&I,
7 Charlotte, or Tyler.
8
- 9 B. PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM
10 D-2665, with solvent weld joints, ASTM D2855. Solid wall PVC only. Not to be
11 used in plenum ceiling spaces, unless proper fire wrap rated for plenums is installed.
12

13 2.3 DRAINS AND CLEANOUTS

- 14 A. Drains and cleanouts manufactured by J.R. Smith, Josam, Sioux Chief, Wade, Watts,
15 or Zurn.
16
- 17 B. Refer to Plumbing Drain and Cleanout Schedule.
18
19

20 PART 3 EXECUTION

21
22 3.1 DRAIN AND VENT PIPING SYSTEM
23

- 24 A. Connect all drain and vent piping to each fixture and piece of equipment and install all
25 required piping as shown on drawings. Provide all necessary fittings and hardware to
26 make required offsets and transitions.
27
- 28 B. Changes in direction of drainage piping shall be made by the appropriate use of 45
29 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.
30
- 31 C. Fittings to be installed to make for the least possibility of stoppage. All horizontal
32 drainage piping less than 3 inches shall be pitched a minimum of 1/4 inch per foot of
33 run. Pitch drainage piping 3 inch and larger a minimum of 1/8" per foot of run.
34
- 35 D. When running drain piping below a footing and parallel to it, piping shall be in all
36 cases be at least one foot greater in distance away from footing than below its bottom.
37 Where possible, run sewers at centerpoint between two parallel footings and maintain
38 above-mentioned distances at a minimum. When running drain piping under a
39 footing, disturb as little of the soil under footing as possible. Provide concrete fill
40 under all footings where excavations wider than 18" are required.
41
- 42 E. When running drain piping through a footing, provide a steel pipe sleeve with 2" thick
43 minimum compressible wrap.
44
- 45 F. Connect to all drains, fixtures and equipment as required.
46

1 3.2 PIPE JOINTS
2

- 3 A. Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards
4 301, 310, and in their publication "Installation Suggestions for Cast Iron No-Hub Pipe
5 and Fittings".
6
7 B. Prepare PVC pipe ends as recommended by manufacturer. Use a P-70 type primer
8 (for PVC) and a PVC solvent cement appropriate to the pipe size and temperature
9 range.
10
11 C. Soldered joints shall be as described in Section 22 05 00.
12

13 3.3 SAFINGS
14

- 15 A. Manufacturers: Noble, Oatey.
16
17 B. Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, joined with CPE
18 solvent; or 3 lb./sq. ft. sheet lead.
19
20 C. Install safing at floor drains above grade. Extend 12" beyond drains in all directions.
21 Cover entire floor in showers and extend 6" up in walls above curbs and to a height of
22 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free
23 of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing
24 water leak test. Install safing at all built-up shower installations. (Note: spray-on and
25 brush applied liquid safing is not acceptable).
26

27 3.4 VENT FLASHING

- 28 A. All vent pipes passing through roof shall be covered with sheet lead weighing not less
29 than 4 pounds per square foot. Sheet lead shall be well flashed onto the roof, 12"
30 around pipe. Vent pipes shall extend a minimum of 12" above roof.
31

32 3.5 CLEANOUTS
33

- 34 A. Provide and install cleanouts as shown on plans and as required by Code.
35

36 3.6 TRAPS
37

- 38 A. Trap all fixtures and equipment. Trap seals shall be standard depth, except when deep
39 seals are required by Code. Traps shall be set true and level and located within the
40 limits of the Code requirements. A trap shall not be used as a separator, interceptor or
41 other type of device to retain solids. All traps above grade shall be provided with
42 approved screw-type cleanout plugs.
43
44 B. Traps shall be protected during construction and sealed to prevent foreign matter from
45 entering. Provide adjustable expansion plug, plastic cap, or approved equivalent.
46
47

1 3.7 TESTING

2
3
4
5
6
7
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9

A. Refer to Testing paragraph of Section 22 05 00.

B. Hydro-statically pressure test all piping to 10 feet of water column pressure for 2 hours. No leaks allowed. Provide mint test of entire system as required by local inspector.

10

END OF SECTION

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SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- B. Section 22 05 00 – Common Work Results for Plumbing
- C. Section 22 07 00 – Plumbing Insulation
- D. Division 26 – Electrical

1.2 SCOPE

- A. This section includes specifications for water heaters, water softeners, pumps and other equipment used for plumbing applications. Included are the following topics:

- 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Description
 - d. Quality Assurance
 - e. Submittals
 - f. Operation and Maintenance
- 2. PART 2 PRODUCTS
 - a. General
 - b. Water Softener
 - c. Water Heater
 - d. Hot Water Circulation Pump
- 3. PART 3 EXECUTION
 - a. Installation
 - b. Water Softener
 - c. Water Heater and Circulation Pump

1.3 DESCRIPTION

- A. Provide plumbing equipment as listed in this section and as scheduled on the drawings.

1.4 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 01 - General Conditions of the Contract, Article 7.

- 1 B. Plumbing products requiring approval by the State of Wisconsin Dept. of Commerce
2 must be approved or have pending approval at the time of shop drawing submission.
3

4 1.5 SUBMITTALS
5

- 6 A. Include data concerning dimensions, capacities, materials of construction, ratings,
7 certifications, weights, pump curves with net positive suction head requirements,
8 manufacturer's installation requirements, manufacturer's performance limitations, and
9 appropriate identification.
10

11 1.6 OPERATION AND MAINTENANCE
12

- 13 A. All operations and maintenance data shall comply with the submission and content
14 requirements specified under section GENERAL REQUIREMENTS.
15
16

17 PART 2 PRODUCTS
18

19 2.1 GENERAL
20

- 21 A. Refer to Plumbing Equipment Schedule for specific model numbers and sizing
22 information of the plumbing equipment specified herein.
23

24 2.2 WATER SOFTENER
25

- 26 A. Water softening systems, equipment, and components shall be manufactured by
27 Capital, Culligan, Diamond, Hellenbrand, North Star, or Marlo.
28
29 B. Mineral/Resin Tank: Fiberglass reinforced tank, cation exchange resin, automatic
30 regeneration, meter actuated, internal bypass, flow control backwash, 150 psi
31 operation, N.S.F. approved, U.L. listed.
32
33 C. Valve: Solid brass type, with hydraulically balanced piston valves, dual drive motors,
34 backwash flow control, automatic bypass and sample clock.
35
36 D. Brine/Salt Storage Tank: Polyethylene tank construction, float system to limit brine,
37 with salt platform and separate well for brine valve. Include cover on tank assembly.
38
39 E. Regeneration Control: Delayed regeneration system set to regenerate on off hours.
40 120 volt, A.C. with 3-prong plug and cord. Set regeneration for early a.m. operation.
41

42 2.3 WATER HEATER
43

- 44 A. High Efficiency Stainless Steel Commercial Gas Fired Water Heater shall be
45 manufactured by Heat Transfer Products, National Combustion, Rheem, Voyager.
46
47 B. Type: Gas fired sealed combustion condensing commercial water heater, minimum
48 95% thermal efficiency. Design to be AGA certified with 3 year tank warranty and 1
49 year parts warranty.

- 1 C. Tank: 316L stainless steel tank rated for 150 psig complete with submerged
2 combustion chamber, 90/10 cupronickel heat exchanger, foam insulation, plastic
3 jacket, brass drain valve and temperature and pressure relief valve.
4
5 D. Burner: Side mounted power burner.
6
7 E. Controls: 120 volt, 1 phase, 60 Hz self-diagnostic electronic controls, intermittent
8 spark or hot surface ignition, operating thermostat with 70°-180°F adjustable
9 temperature control, energy cutoff with manual reset, blower pressure switch, gas
10 valve and pressure regulator.
11
12 F. Vent: 2" CPVC or ABS flue gas outlet and PVC, CPVC or ABS combustion air
13 intake with DWV solvent weld fittings.
14

15 2.4 HOT WATER CIRCULATING PUMPS

- 16
17 A. Pump shall be manufactured by Armstrong, Bell & Gossett, Taco, or Thrush.
18
19 B. Pump shall be 120 volt, single phase, 3450 RPM, in-line bronze pump, with Noryl
20 impeller. Refer to Plumbing Equipment Schedule on drawings for model number and
21 capacity.
22
23 C. Time Control: Time controls shall be manufactured by Paragon Electric Co. or
24 equivalent. Provide a 120 VAC electronic programmable time controller for each
25 circulating pump. Unit shall include seven day, 365 day per year programmable
26 features and rechargeable battery backup; Paragon Electric Co. model number EC72.
27
28 D. Motor Starter: Starters shall be manufactured by Allen-Bradley, Cutler-Hammer,
29 G.E., or Square D. Provide a single phase manual motor starter switch for starting and
30 controlling each pump, with internal overload protection, general purpose enclosure,
31 neon pilot light and HAND-OFF-AUTO selector switch; Allen-Bradley Model
32 600-TAX142.
33
34

35 PART 3 EXECUTION

36
37 3.1 INSTALLATION

- 38
39 A. Install plumbing equipment where indicated in accordance with manufacturer's
40 recommendations. Coordinate equipment location with piping, ductwork, conduit and
41 equipment of other trades to allow sufficient clearances. Locate equipment and
42 arrange plumbing piping to provide access space for servicing all components.
43
44 B. Set commercial water heaters and commercial water softeners on concrete
45 housekeeping pads. Adjust and level equipment.
46
47 C. Connect equipment to water and drain piping using unions or flanges and isolation
48 valves.
49

- 1 D. Size temperature and relief valves per CSA ratings. Pipe temperature and pressure
2 relief valves to floor drain or floor as indicated.
3
- 4 E. Startup and test equipment adjusting operating and safety controls for proper
5 operation.
6
- 7 F. Lubricate pumps before startup. Adjust pumps for rated flow. Clean and blowdown
8 strainers after 8 hours of operation.
9
- 10 3.2 WATER SOFTENER
11
- 12 A. Provide full size valved bypass and valved inlet/outlet piping. Pipe backwash to
13 nearby hub drain.
14
- 15 B. Install softener per manufacturer's recommendation.
16
- 17 C. Provide 1000 lb. of pelletized salt for initial start-up and operation.
18
- 19 3.3 WATER HEATER AND CIRCULATION PUMP
20
- 21 A. Provide piping, unions, valves, thermometers, relief valves, and hardware.
22
- 23 B. Locate water heaters with controls, relief valves, and access holes accessible for
24 service and replacement without moving heaters. Install relief valve and extend relief
25 piping individually and full size to the nearest floor drain.
26
- 27 C. Install the domestic water heater and circulator in accordance with the Manufacturer's
28 instructions and recommendations.
29
- 30 D. Power wiring shall be provided by the EC.
31
- 32 E. Mount each domestic water heater and storage tank on a 3½" high concrete pad.
33
- 34 F. Mount each domestic water heater and storage tank on shelf mounted from structure.
35 Install drain pan, and terminate drain pipe 6" above floor.
36
- 37 G. The manufacturer shall provide a written service warranty which shall provide factory
38 service for a period of one year following the acceptance of the installation. The
39 one-year service warranty shall be submitted at the time of the certified shop drawings
40 submittal. The one-year service warranty by the manufacturer shall provide free parts
41 and labor to correct malfunctions of the boiler-burner unit during the warranty period.
42
- 43 H. Gas Fired Water Heaters:
44 1. Provide the services of a local factory authorized representative for gas fired
45 equipment startup. A letter of compliance with factory recommendations and
46 installation instructions shall be submitted with operation and maintenance
47 instructions.

- 1 2. The discharge of boiler relief or safety valves shall be piped individually and full
2 size to the nearest floor drain. Extend a condensate drain line from the boiler and
3 also the boiler venting individually to the nearest floor drain.
4 3. The vent connections on pressure regulating valves, shall be piped separately to
5 the outside atmosphere and terminated with an insect screened, weatherproof cap.
6 4. Venting:
7 a. Vent the gas fired units in accordance with the manufacturer's requirements.
8 Vent piping and fittings shall be provided by the boiler manufacturer in a
9 single kit specific for this boiler and for this project. Install venting to
10 maintain appliance sealed combustion rating.

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END OF SECTION

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SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- 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

1.2 SCOPE

- A. This section includes specifications for plumbing fixtures, faucets and trim for this project. Included are the following topics:
 - 1. PART 1 GENERAL
 - a. Related Documents
 - b. Scope
 - c. Description
 - d. Reference Standards
 - e. Quality Assurance
 - f. Submittals
 - 2. PART 2 PRODUCTS
 - a. General
 - b. Manufacturers
 - 3. PART 2 EXECUTION
 - a. Installation

1.3 DESCRIPTION

- A. Furnish and install plumbing fixtures with traps, drains, stops, faucets, flush valves, carriers and hardware.

1.4 REFERENCE STANDARDS

- A. ANSI A112.6.1M-88 Supports for Off-the Floor Plumbing Fixtures for Public Use.
- B. ANSI A112.18.1-94 Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI A112.19.2M-82 Vitreous China Plumbing Fixtures.

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D. ANSI A112.19.5-79(R1990) Trim for Water Closet Bowls, Tanks and Urinals.

E. ASSE 1011-93 Hose Connection Vacuum Breakers.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to 22 05 00 and Division 01 of the Project Manual.

B. Plumbing products requiring approval by the State of Wisconsin must be approved or have pending approval at the time of shop drawing submission.

1.6 SUBMITTALS

A. Submit product data sheets in accordance with Division 01 and Section 22 05 00.

B. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 PRODUCTS

2.1 GENERAL

A. Fixtures must conform to general requirements given below and to specified requirements for each type.

B. Vitreous china fixtures shall conform to ANSI A112.19.2M.

C. Stainless steel fixtures shall conform to ANSI A112.19.3.

D. Fixtures shall be installed so that parts are accessible for repairs when fixtures are in place. Manufacturer's trademark or name shall be visible on fixtures.

E. Faucets, traps, exposed fittings and trim shall be polished chrome plated unless otherwise specified. Provide polished chrome plated nipples at all lavatories.

F. Exposed piping penetrating walls, floors or ceilings shall have chrome plated escutcheons, or flanges of sufficient depth to seal the opening.

G. Fixture stops shall be heavy duty commercial grade, slow compression angle valves with 1/2" inlet and 3/8" or 1/2" chrome plated flexible riser.

H. Traps shall be semi-cast 17-gauge brass, chrome plated, with cleanout and escutcheon. Sink traps shall be 1-1/2" minimum.

1 2.2 MANUFACTURERS
2

- 3 A. Vitreous china fixtures shall be manufactured by American-Standard, Kohler, Sloan,
4 Toto, or Zurn. Fixture color shall be white unless specified otherwise.
5
6 B. Flush valves shall be manufactured by Sloan (“Royal” series), or Zurn
7 (“Aquavantage” series).
8
9 C. Solid plastic toilet seats shall be manufactured by Bemis, Benneke, Centoco, Church,
10 Olsonite, Kohler, or Zurn. Seat color shall match fixture unless specified otherwise.
11
12 D. Carriers for wall-mounted fixtures shall be manufactured by J.R. Smith, Josam,
13 MIFAB, Wade, Watts, or Zurn.
14
15 E. Stainless steel sinks shall be manufactured by Elkay, Just, or Kohler.
16
17 F. Faucets shall be manufactured by Chicago Faucet or Zurn as scheduled on drawings.
18
19 G. Heavy duty stops and supplies shall be manufactured by Chicago Faucet, Dearborn,
20 EBC, Kohler, McGuire, T&S Brass, or Zurn.
21
22 H. Traps shall be semi-cast 17 gauge brass, chrome plated, with cleanout and escutcheon
23 as manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.
24
25 I. Supply, drain and trap insulating kits shall be manufactured by Brocar, EBC,
26 McGuire, Plumberex, or Truebro.
27
28 J. Fixtures:
29 1. See Plumbing Fixture Schedule on drawings for type, manufacturer, and model
30 for fixtures. Substitutions to scheduled fixtures is not allowed, unless previously
31 approved by A/E and City of Madison.
32
33

34 PART 3 EXECUTION
35

36 3.1 INSTALLATION
37

- 38 A. Install plumbing fixtures in accordance with manufacturer’s instructions. Set level and
39 plumb. Secure in place to counters, floors and walls providing solid bearing and
40 secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping
41 to prevent movement of exposed piping.
42
43 B. Install each fixture with trap easily removable for servicing and cleaning. Install
44 fixture stops in readily accessible location for servicing. Individual supplies to fixtures
45 shall be provided with support to prevent movement.
46
47 C. Install barrier free fixtures in compliance with local and Federal ADA Accessibility
48 Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies
49 and stops elevated to avoid contact by wheelchair users.

- 1 D. Seal joints between countertop, wall, floor and fixtures with G.E. Silicone caulk;
2 white, clear or color to match fixture with colored caulk by fixture manufacturer.
3
4 E. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall
5 be heavy duty type with brass stems and screwed or sweat inlet connections.
6 Compression type inlets are not acceptable.
7
8 F. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and
9 escutcheons to be chrome plated brass, same items in concealed locations may be of
10 rough brass finish.
11
12 G. After installation, fixtures shall be protected to prevent scratching or other damage
13 during construction.
14
15 H. Prior to acceptance, fixtures shall be cleaned with compounds recommended by the
16 respective manufacturer.
17
18
19

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

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. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Continuity of Existing Services
 - f. Protection of Finished Surfaces
 - g. Sleeves and Openings
 - h. Sealing and Fire Stopping
 - i. Equipment Furnished By Others
 - j. Provisions for Future
 - k. Submittals
 - l. Off Site Storage
 - m. Certificates and Inspections
 - n. Operating and Maintenance Data
 - o. Training of Owner Personnel
 - p. Record Drawings
 - q. Cleaning
 - r. Warranty
2. Part 2 – Products
 - a. Access Panels and Doors
 - b. Identification
 - c. Sealing and Fire Stopping
3. Part 3 – Execution
 - a. Demolition
 - b. Concrete Work
 - c. Cutting and Patching
 - d. Building Access
 - e. Equipment Access
 - f. Coordination
 - g. Identification
 - h. Lubrication
 - i. Sleeves and Openings
 - j. Sealing and Fire Stopping

1 1.3 RELATED WORK

- 2
3 A. Section 07 84 00 - Fire Stopping
4
5 B. Section 23 05 13 - Common Motor Requirements for HVAC.
6
7 C. Section 23 33 00 - Air Duct Accessories.
8

9 1.4 REFERENCE STANDARDS

- 10
11 A. Abbreviations of standards organizations referenced in other sections are as follows:
12 1. AABC Associated Air Balance Council
13 2. ADC Air Diffusion Council
14 3. AGA American Gas Association
15 4. AMCA Air Movement and Control Association
16 5. ANSI American National Standards Institute
17 6. ARI Air-Conditioning and Refrigeration Institute
18 7. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
19 8. ASME American Society of Mechanical Engineers
20 9. ASTM American Society for Testing and Materials
21 10. EPA Environmental Protection Agency
22 11. GAMA Gas Appliance Manufacturers Association
23 12. IEEE Institute of Electrical and Electronics Engineers
24 13. ISA Instrument Society of America
25 14. MCA Mechanical Contractors Association
26 15. MICA Midwest Insulation Contractors Association
27 16. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
28 17. NBS National Bureau of Standards
29 18. NEBB National Environmental Balancing Bureau
30 19. NEC National Electric Code
31 20. NEMA National Electrical Manufacturers Association
32 21. NFPA National Fire Protection Association
33 22. SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
34 23. UL Underwriters Laboratories Inc.
35 24. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
36 25. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building
37 Materials
38 26. UL1479 Fire Tests of Through-Penetration Firestops
39 27. UL723 Surface Burning Characteristics of Building Materials
40

41 1.5 QUALITY ASSURANCE

- 42
43 A. Refer to Division 1, General Conditions, Equals and Substitutions.
44
45 B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions,
46 ratings, or engineering parameters from those indicated on the contract documents, the contractor
47 is responsible for all costs involved in integrating the equipment or accessories into the system

1 and for obtaining the performance from the system into which these items are placed. This may
2 include changes found necessary during the testing, adjusting, and balancing phase of the project.
3

4 1.6 CONTINUITY OF EXISTING SERVICES
5

- 6 A. Do not interrupt or change existing services without prior written approval from the owner, or
7 facilities maintenance. When interruption is required, coordinate the down-time with the user
8 agency to minimize disruption to their activities. Unless specifically stated, all work involved in
9 interrupting or changing existing services is to be done during normal working hours.
10

11 1.7 PROTECTION OF FINISHED SURFACES
12

- 13 A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.
14
15 B. Furnish one can of touch-up paint for each different color factory finish which is to be the final
16 finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as
17 covered in the General Requirements.
18

19 1.8 SLEEVES AND OPENINGS
20

- 21 A. Refer to Division 1, General Requirements, Sleeves and Openings.
22

23 1.9 SEALING AND FIRE STOPPING
24

- 25 A. Sealing and fire stopping of sleeves/openings between ductwork, piping, etc. and the sleeve,
26 structural or partition opening shall be the responsibility of the contractor whose work penetrates
27 the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated
28 penetrations in compliance with section 07 84 00 Fire Stopping.
29

30 1.10 EQUIPMENT FURNISHED BY OTHERS
31

- 32 A. None.
33

34 1.11 PROVISIONS FOR FUTURE
35

- 36 A. None.
37

38 1.12 SUBMITTALS
39

- 40 A. Refer to Division 1, General Conditions, Submittals.
41
42 B. Submit for all equipment and systems as indicated in the respective specification sections,
43 marking each submittal with that specification section number. Mark general catalog sheets and
44 drawings to indicate specific items being submitted and proper identification of equipment by
45 name and/or number, as indicated in the contract documents.
46

- 1 C. Before submitting electrically powered equipment, verify that the electrical power and control
2 requirements for the equipment are in agreement with the motor starter schedule on the electrical
3 drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the
4 equipment submitted and the motor starter schedules are in agreement or indicate any
5 discrepancies. See related comments in Section 23 05 13 in Part 1 under Electrical Coordination.
6
- 7 D. Include wiring diagrams of electrically powered equipment.
8
- 9 E. Submit electronic (PDF) copy of all submittals for review by A/E, Architect, Owner, Owners
10 Representative and Building Operator.
11
- 12 F. OFF SITE STORAGE
13 1. Any required offset storage of material is the responsibility of the contractor. Materials or
14 equipment damaged while stored offsite, or while transported to or from offset storage will
15 not be allowed to be installed.
16
- 17 G. CERTIFICATES AND INSPECTIONS
18 1. Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.
19 2. Obtain and pay for all required State installation inspections except those provided by the
20 Architect/Engineer in accordance with code. Deliver originals of these certificates to the
21 Division Project Representative. Include copies of the certificates in the Operating and
22 Maintenance Instructions.
23
- 24 H. OPERATION AND MAINTENANCE DATA
25 1. All operations and maintenance data shall comply with the submission and content
26 requirements specified under section GENERAL REQUIREMENTS.
27 2. In addition to the general content specified under GENERAL REQUIREMENTS supply the
28 following additional documentation:
29 a. Records of tests performed a to certify compliance with system requirements
30 b. Certificates of inspection by regulatory agencies
31 c. Lubrication instructions, including list/frequency of lubrication
32 d. Copies of all approved shop drawings.
33 e. Manufacturer's wiring diagrams for electrically powered equipment
34 f. Temperature control record drawings and control sequences
35 g. Parts lists for manufactured equipment
36 h. Warranties
37 i. Additional information as indicated in the technical specification sections
38 3. Provide three (3) hardcopies of the Operation and Maintenance Manual. Manuals shall be
39 organized in three ring binders with dividers and reference tabs. Manuals shall be delivered
40 as follows:
41 a. Two copies to the City of Madison.
42 b. One copy to be kept on site.
43 4. Provide three (3) electronic (Adobe PDF) copies of the Operation and Maintenance Manual.
44 a. Provide each copy on a separate portable USB flash drive.
45 b. Deliver each portable USB drive with hardcopy manuals to parties listed above.
46
47

1 I. TRAINING OF OWNER PERSONNEL

- 2 1. Instruct user agency personnel in the proper operation and maintenance of systems and
3 equipment provided as part of this project; video tape all training sessions. Include not less
4 than 8 hours of instruction, using the Operating and Maintenance manuals during this
5 instruction. Demonstrate startup and shutdown procedures for all equipment. All training to
6 be during normal working hours.
7

8 J. RECORD DRAWINGS

- 9 1. Refer to Division 1, General Requirements, Record Drawings.
10 2. In addition to the data indicated in the General Requirements, maintain temperature control
11 record drawings on originals prepared by the installing contractor/subcontractor. Include
12 copies of these record drawings with the Operating and Maintenance manuals.
13

14 K. CLEANING

- 15 1. Keep the premises broom clean and free of surplus materials, rubbish and debris.
16 2. Clean all equipment, piping, duct, strainers, filters, etc. prior to building turnover to owner.
17 All systems shall be turned over to owner in condition ready for operation.
18

19 L. WARRANTY

- 20 1. Warrant that work shall function for one year immediately following the acceptance of the
21 system(s). The date of acceptance shall be an agreed upon date by all parties, including
22 Division 23 contractor, General Contractor, Owner, Tenant and A/E.
23 2. Keep the system in good working order at no expense, unless defects are clearly the result of
24 improper usage.
25 3. Submit for acceptance of the work, written certification that the entire system has been
26 installed and adjusted for operation in accordance with the Contract Documents.
27

28 PART 2 PRODUCTS

29
30 2.1 ACCESS PANELS AND DOORS

31
32 A. LAY-IN CEILINGS:

- 33 1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under
34 Section 09500 are sufficient; no additional access provisions are required unless specifically
35 indicated.
36

37 B. Plaster Walls and Ceilings:

- 38 1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for
39 general applications, stainless steel for use in toilets, showers, and similar wet areas,
40 concealed hinges, screwdriver operated cam latch for general applications, key lock for use
41 in public areas, UL listed for use in fire rated partitions if required by the application. Use
42 the largest size access opening possible, consistent with the space and the equipment needing
43 service; minimum size is 12" by 12".
44
45
46

1 2.2 IDENTIFICATION
2

3 A. STENCILS

- 4 1. Not less than 1 inch high letters/numbers for marking pipe and equipment.
5

6 B. SNAP-ON PIPE MARKERS

- 7 1. Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in
8 place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers
9 and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services, or
10 equal.
11

12 C. ENGRAVED NAME PLATES

- 13 1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw
14 mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by
15 EMED Co., or equal by Marking Services, or W. H. Brady.
16

17 D. VALVE TAGS

- 18 1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4
19 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem,
20 available from EMED Co., Seton Name Plate Company, Marking Services, or W. H. Brady.
21

22 2.3 SEALING AND FIRE STOPPING
23

24 A. FIRE AND/OR SMOKE RATED PENETRATIONS

- 25 1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in
26 compliance with section 07 84 00 "Fire Stopping".
27

28 B. NON-RATED PENETRATIONS
29

30 1. Pipe Penetrations

- 31 a. At pipe penetrations of non-rated interior walls, floors and exterior walls above grade,
32 use urethane caulk in annular space between pipe insulation and sleeve. For non-rated
33 drywall, plaster or wood walls where sleeve is not required use urethane caulk in
34 annular space between pipe insulation and wall material.
35

36 2. Duct Penetrations

- 37 a. Where shown or specified, pack annular space with fiberglass batt insulation or mineral
38 wool insulation. Provide 4" sheet metal escutcheon around duct on both sides of
39 partition or floor to cover annular space.
40

41 PART 3 EXECUTION

42 3.1 DEMOLITION
43

- 44 A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition
45 work is to be performed adjacent to existing work that remains in an occupied area, construct
46 temporary dust partition to minimize the amount of contamination of the occupied space. Where
47 pipe or duct is removed and not reconnected with new work, cap ends of existing services as if

1 they were new work. Coordinate work with the user agency to minimize disruption to the
2 existing building occupants.

- 3
4 B. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished,
5 abandoned, or deactivated are to be removed from the site by the Contractor. All piping and
6 ductwork specialties are to be removed from the site by the Contractor unless they are dismantled
7 and removed or stored by the user agency. All designated equipment is to be turned over to the
8 user agency for their use at a place and time so designated. Maintain the condition of material
9 and/or equipment that is indicated to be reused equal to that existing before work began.

10
11 3.2 CONCRETE WORK

- 12
13 A. All cast-in-place concrete will be performed by this contractor. Provide all layout drawings,
14 anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form
15 concrete for support of mechanical equipment.

16
17 3.3 CUTTING AND PATCHING

- 18
19 A. Refer to Division 1, General Requirements, Cutting and Patching.

20
21 3.4 BUILDING ACCESS

- 22
23 A. Arrange for the necessary openings in the building to allow for admittance of all apparatus.
24 When the building access was not previously arranged and must be provided by this contractor,
25 restore any opening to its original condition after the apparatus has been brought into the
26 building.

27
28 3.5 EQUIPMENT ACCESS

- 29
30 A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for
31 maintenance and service. Coordinate the exact location of wall and ceiling access panels and
32 doors with the General Contractor, making sure that access is available for all equipment and
33 specialties. Access doors in general construction are to be furnished by the Mechanical
34 Contractor and installed by the General Contractor.

- 35
36 B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible
37 ceilings which do not require access panels.

38
39 3.6 COORDINATION

- 40
41 A. Verify that all devices are compatible for the surfaces on which they will be used. This includes,
42 but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or
43 cooling terminal units installed in/on architectural surfaces.
44
45 B. Coordinate all work with other contractors prior to installation. Any installed work that is not
46 coordinated and that interferes with other contractor's work shall be removed or relocated at the
47 installing contractor's expense.

- 1 C. Cooperate with the test and balance agency in ensuring Section 23 05 93 specification
2 compliance. Verify system completion to the test and balance agency (flushing, pressure testing,
3 clean filters, duct systems cleaned, controls adjusted and calibrated, controls cycled through their
4 sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and
5 flow measuring devices, gauges, temperature controls, etc., required for functional and balanced
6 systems. Demonstrate the starting, interlocking and control features of each system so the test
7 and balance agency can perform its work.
8

9 3.7 IDENTIFICATION

- 10
11 A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service
12 with one coat of black enamel against a light background or white enamel against a dark
13 background. Use a primer where necessary for proper paint adhesion. Do not label equipment
14 such as cabinet heaters and ceiling fans in occupied spaces.
15
16 B. Where stenciling is not appropriate for equipment identification, engraved name plates may be
17 used.
18
19 C. Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each
20 access door or panel, and on both side of the partition where exposed piping passes through walls,
21 floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat
22 of black enamel against a light background or white enamel against a dark background for
23 stenciling, or provide snap-on pipe markers as specified in Part 2 – Products.
24
25 D. Use engraved name plates to identify control equipment.
26
27 E. Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork
28 directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, “SMOKE
29 DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include
30 a second line listing the individual damper tag. The tags must be coordinated with the
31 mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification
32 are unacceptable. All labels shall be clearly visible from the ceiling access point.
33

34 3.8 LUBRICATION

- 35
36 A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment
37 is operated for any reason. Once the equipment has been run, maintain lubrication in accordance
38 with the manufacturer's instructions until the work is accepted by the owner. Maintain a log of all
39 lubricants used and frequency of lubrication; include this information in the Operating and
40 Maintenance Manuals at the completion of the project.
41

42 3.9 SLEEVES AND OPENINGS

- 43
44 A. Pipe penetrations in new poured concrete horizontal construction requiring F and T rating: Form
45 opening using hole form or core drill opening. Alternatively provide cast in place fire stopping
46 devices/sleeves.
47

- 1 B. Pipe penetrations in new poured concrete horizontal construction requiring F rating but no T
2 rating: Same as pipe penetrations in new poured concrete construction requiring F and T ratings
3 except that schedule 40 steel sleeves may also be used.
4
5 C. Pipe penetrations in new poured concrete horizontal construction that do not require F or T
6 ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill
7 opening.
8
9 D. Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or
10 structural bearing collar designed to carry load.
11

12 3.10 DUCT SLEEVES:
13

- 14 A. Duct sleeves are not required in non-rated partitions or floors.
15
16 B. Provide sleeve required for fire dampers in fire-rated partitions and floors. Reference fire damper
17 details on drawings.
18

19 3.11 SEALING AND FIRE STOPPING
20

21 A. FIRE AND/OR SMOKE RATED PENETRATIONS

- 22 1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in
23 compliance with section 07 84 00 Fire Stopping.
24

25 B. NON-RATED PENETRATIONS:

- 26 1. At all interior walls and exterior walls, pipe penetrations are required to be sealed. Apply
27 sealant to both sides of the penetration in such a manner that the annular space between the
28 pipe sleeve or cored opening and the pipe or insulation is completely blocked.
29 2. Duct penetrations through non-rated partitions shall require sheet metal escutcheons with
30 fiberglass or mineral wool insulation fill.
31

32
33 END OF SECTION

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SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable portions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes requirements for single and three phase motors that are used with equipment specified in other sections. Included are the following topics:

- 1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Shop Drawings
 - f. Operating and Maintenance Data
 - g. Electrical Coordination
 - h. Product Criteria
- 2. Part 2 – Products
 - a. Three Phase, Single Speed Motors
 - b. Single Phase, Single Speed Motors
- 3. Part 3 – Execution
 - a. Installation

1.3 RELATED WORK

- A. Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC
- B. Division 26 00 00 - Electrical

1.4 REFERENCE STANDARDS

- A. ANSI/IEEE 112 Test Procedure for Polyphase Induction Motors and Generators
- B. ANSI/NEMA MG-1 Motors and Generators
- C. ANSI/NFPA 70 National Electrical Code

1.5 QUALITY ASSURANCE

- A. Refer to Division 1, General Conditions, Equals and Substitutions.

1 1.6 SHOP DRAWINGS

- 2
- 3 A. Refer to Division 1, General Conditions, Submittals.
- 4
- 5 B. Include with the equipment which the motor drives the following motor information:
- 6 motor manufacturer, horsepower, voltage, phase, hertz, rpm, full load efficiency.
- 7 Include project wiring diagrams prepared by the contractor specifically for this work.
- 8

9 1.7 OPERATION AND MAINTENANCE DATA

- 10
- 11 A. All operations and maintenance data shall comply with the submission and content
- 12 requirements specified under section GENERAL REQUIREMENTS.
- 13

14 1.8 ELECTRICAL COORDINATION

- 15
- 16 A. All starters, overload relay heater coils, disconnect switches and fuses, relays, wire,
- 17 conduit, pushbuttons, pilot lights, and other devices required for the control of motors
- 18 or electrical equipment are furnished and installed by the Electrical Contractor, except
- 19 as specifically noted elsewhere in this division of specifications.
- 20
- 21 B. Electrical drawings and/or specifications show number and horsepower rating of all
- 22 motors furnished by this Contractor, together with their actuating devices if these
- 23 devices are furnished by the Electrical Contractor. Should any discrepancy in size,
- 24 horsepower rating, electrical characteristics or means of control be found for any
- 25 motor or other electrical equipment after contracts are awarded, Contractor is to
- 26 immediately notify the architect/engineer of such discrepancy. Costs involved in any
- 27 changes required due to equipment substitutions initiated by this contractor will be the
- 28 responsibility of this contractor. See related comments in Section 23 05 00 - Common
- 29 Work Results for HVAC, under Shop Drawings.
- 30
- 31 C. Electrical Contractor will provide all power wiring and control wiring, except
- 32 temperature control wiring.
- 33
- 34 D. Furnish project specific wiring diagrams to Electrical Contractor for all equipment and
- 35 devices furnished by this Contractor and indicated to be wired by the Electrical
- 36 Contractor.
- 37

38 1.9 PRODUCT CRITERIA

- 39
- 40 A. Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC
- 41 standards and shall be listed by U.L. for the service specified.
- 42
- 43 B. Select motors for conditions in which they will be required to perform; i.e., general
- 44 purpose, splashproof, explosion proof, standard duty, high torque or any other special
- 45 type as required by the equipment or motor manufacturer's recommendations.
- 46
- 47 C. Furnish motors for starting in accordance with utility requirements and compatible
- 48 with starters as specified.

1 PART 2 PRODUCTS

2
3 2.1 THREE PHASE, SINGLE SPEED MOTORS

- 4
5 A. Use NEMA rated three phase, 60 hertz motors for all motors 1/2 HP and larger unless
6 specifically indicated.
7
8 B. Use NEMA general purpose, continuous duty, Design B, normal starting torque, T-
9 frame or U-frame motors with Class B or better insulation unless the manufacturer of
10 the equipment on which the motor is being used has different requirements. Use open
11 drip-proof motors unless totally enclosed fan-cooled, totally enclosed non-ventilated,
12 explosion-proof, or encapsulated motors are specified in the equipment sections.
13
14 C. Use grease lubricated anti-friction ball bearings with housings equipped with
15 plugged/capped provision for relubrication, rated for minimum AFBMA 9, L-10 life
16 of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with
17 belt center line at the end of NEMA standard shaft extension. Stamp bearing sizes on
18 nameplate.
19
20 D. All open drip-proof motors to have a 1.15 service factor. Other motor types may have
21 minimum 1.0 service factors.
22
23 E. All motors 1 HP and larger, except specially wound motors and inline pump motors
24 56 frame and smaller, to be high efficiency design with full load efficiencies which
25 meet or exceed the values listed below when tested in accordance with NEMA MG 1.
26

27 FULL LOAD NOMINAL MOTOR EFFICIENCY BY MOTOR SIZE AND SPEED

28 -----Open Drip-Proof Motors-----
29 -----Nominal Motor Speed-----

30 MOTOR HP	1200 rpm	1800 rpm	3600 rpm
31 1	82.5	85.5	77.0
32 1-1/2	86.5	86.5	84.0
33 2	87.5	86.5	85.5
34 3	88.5	89.5	85.5
35 5	89.5	89.5	86.5
36 7-1/2	90.2	91.0	88.5

37
38
39 ----Totally Enclosed Fan-Cooled----
40 -----Nominal Motor Speed-----

41 MOTOR HP	1200 rpm	1800 rpm	3600 rpm
42 1	82.5	85.5	77.0
43 1-1/2	87.5	86.5	84.0
44 2	88.5	86.5	85.5
45 3	89.5	89.5	86.5
46 5	89.5	89.5	88.5
47 7-1/2	91.0	91.7	89.5

48
49
50 2.2 SINGLE PHASE, SINGLE SPEED MOTORS

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Description
 - f. Shop Drawings
 - g. Design Criteria
2. Part 2 – Products
 - a. Pipe Hanger and Support Manufacturers
 - b. Structural Supports
 - c. Pipe Hangers and Supports
 - d. Beam Clamps
 - e. Wood Structure Supports
 - f. Equipment Curbs
 - g. Pipe Penetrations through Roof
3. Part 3 – Execution
 - a. Installation
 - b. Hanger and Support Spacing
 - c. Vertical Riser Clamps
 - d. Equipment Curbs
 - e. Pipe Penetration through Roof

1.3 RELATED WORK

- A. Section 23 07 00 - HVAC Insulation

1.4 REFERENCE STANDARDS

- A. MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

1.5 QUALITY ASSURANCE

- A. Refer to Division 1, General Conditions, Equals and Substitutions.

1 1.6 DESCRIPTION
2

- 3 A. Provide all supporting devices as required for the installation of mechanical
4 equipment and materials. All supports and installation procedures are to conform to
5 the latest requirements of the ANSI Code for pressure piping.
6
7 B. Do not hang any mechanical item directly from a metal deck or run piping so it rests
8 on the bottom chord of any truss or joist.
9
10 C. Support apparatus and material under all conditions of operation, variations in
11 installed and operating weight of equipment and piping, to prevent excess stress, and
12 allow for proper expansion and contraction.
13
14 D. Protect insulation at all hanger points; see Related Work above.

15
16 1.7 SHOP DRAWINGS
17

- 18 A. Refer to division 1, General Conditions, Submittals.
19
20 B. Schedule of all hanger and support devices indicating shields, attachment methods,
21 and type of device for each pipe size and type of service. Reference section 23 05 00.
22

23 1.8 DESIGN CRITERIA
24

- 25 A. Materials and application of pipe hangers and supports shall be in accordance with
26 MSS Standard Practice SP-58 unless noted otherwise.
27
28 B. Piping connected to base mounted pumps, compressors, or other rotating or
29 reciprocating equipment is to have vibration isolation supports for a distance of one
30 hundred pipe diameters or three supports away from the equipment, whichever is
31 greater. Standard pipe hangers/supports as specified in this section are required
32 beyond the 100 pipe diameter/3 support distance.
33
34 C. Piping supported by laying on the bottom chord of joists or trusses will not be
35 accepted.
36
37 D. Fasteners depending on soft lead for holding power or requiring powder actuation will
38 not be accepted.
39
40 E. Allow sufficient space between adjacent pipes and ducts for insulation, valve
41 operation, routine maintenance, etc.
42

43 PART 2 PRODUCTS
44

45 2.1 PIPE HANGER AND SUPPORT MANUFACTURERS
46

- 47 A. Anvil, B-Line, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved
48 equal. Anvil figure numbers are listed below; equivalent material by other
49 manufacturers is acceptable.

1 2.2 STRUCTURAL SUPPORTS
2

- 3 A. Provide all supporting steel required for the installation of mechanical equipment and
4 materials, whether or not it is specifically indicated or sized, including angles,
5 channels, beams, etc. to suspend or floor support tanks and equipment.
6

7 2.3 PIPE HANGERS AND SUPPORTS
8

9 A. Hangers For Steel Pipe Sizes 1/2" Through 2"

- 10 1. Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.
11

12 B. Multiple Or Trapeze Hangers

- 13 1. Steel channels with welded spacers and hanger rods if calculations are submitted.
14

15 C. Wall Support

- 16 1. Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.
17 2. Perforated epoxy painted finish, 16-12 gauge min., steel channels securely
18 anchored to wall structure with interlocking, split type, bolt secured, galvanized
19 pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Anvil
20 type AS200 H with AS 1200 clamps. When copper piping is being supported,
21 provide flexible elastomeric/thermoplastic isolation cushion material to
22 completely encircle the piping and avoid contact with the channel or clamp,
23 equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and
24 cushion assemblies, B-Line BVT series, Anvil cushion clamp assembly.
25

26 D. Vertical Riser Support

- 27 1. Carbon steel riser clamp, copper plated when used with copper pipe. Anvil
28 figure 261 for steel pipe, figure CT121 for copper pipe.
29

30 E. Floor Support For Pipe Sizes Through 4"

- 31 1. Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or
32 steel support.
33

34 F. Copper Pipe Support

- 35 1. Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.
36

37 G. Insulation Protection Shields

- 38 1. Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2
39 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.
40

41 H. Steel Hanger Rods

- 42 1. Threaded both ends, threaded one end, or continuous threaded, black finish.
43 2. Size rods for individual hangers and trapeze support as indicated in the following
44 schedule.
45 3. Total weight of equipment, including valves, fittings, pipe, pipe content, and
46 insulation, are not to exceed the limits indicated.
47
48
49

1	Maximum Load (Lbs.)	Rod Diameter
2	<u>(650°F Maximum Temp.)</u>	<u>(inches)</u>
3	610	3/8
4	1130	1/2
5	1810	5/8
6		

7 4. Provide rods complete with adjusting and lock nuts.

8
9 2.4 WOOD STRUCTURE SUPPORTS

- 10
11 A. Carbon steel pipe short strap for piping 1/2" through 2". Fastened with two No. 24 x 2
12 (minimum size) wood screws. Anvil Figure 262.
13
14 B. Carbon steel coach screw rods machine threaded on opposite ends, minimum 3/8"
15 diameter. Anvil Figure 142.
16
17 C. Carbon steel side beam bracket with minimum 3/8" rod size and fastened with
18 minimum 1/2" x 3" lag screws. Anvil Figure 207
19

20 2.5 BEAM CLAMPS

- 21
22 A. MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62
23 inches thick for single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with
24 pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil
25 figure 86.
26
27 B. MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock
28 clamp in place, suitable for rod sizes to 1-1/2 inch diameter but limited in application
29 to pipe sizes 8 inch and less without prior approval. Anvil figure 228.
30

31 2.6 EQUIPMENT CURBS

- 32
33 A. Wood Build Sleeper Curb
34 1. Constructed of wood blocking and anchored to the deck. The curb must be
35 structurally capable of supporting the intended load with no penetrations through
36 the curb flashing. Galvanized steel counter flashing. Do not use built-in metal
37 base flashings or cants. Use 18 inch high equipment curbs where the curb
38 completely surrounds the perimeter of the equipment and there is no roof
39 exposed to the weather.
40

41 2.7 PIPE PENETRATIONS THROUGH ROOF

- 42
43 A. Multiple Pipe Penetrations
44 1. Refer to acceptable Equipment Curb types listed above for curb specifications.
45 An 8" high (minimum) curb height is required. The coping cap shall be
46 constructed from laminated acrylic clad thermoplastic (ABS) with graduated step
47 boots to accommodate various size pipes, stainless steel fastening screws for
48 cover, stainless steel band clamps for securing boots around the pipe, and
49 stainless steel band clamp or mechanical locking seal for securing boots around
50 the ABS coping cap flanges.

1 B. Single Pipe Penetrations

2 1. A stack flashing penetration may be utilized for single pipe penetrations through
3 built up roofs and single ply membrane roofs. Utilize high temperature sealant
4 for all high temperature applications. This includes but is not limited to steam
5 condensate vent piping, steam safety relief piping, and flues.
6

7 C. A single pre-manufactured boot may be utilized for single pipe penetrations through
8 single ply membrane roofs only.
9

10 PART 3 EXECUTION

11
12 3.1 INSTALLATION

13
14 A. Install supports to provide for free expansion of the piping and duct system. Support
15 all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall
16 brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the
17 structure and test to demonstrate the adequacy of the fastening.
18

19 B. Piping shall be supported independently from ductwork and all other trades.
20

21 C. Where piping can be conveniently grouped to allow the use of trapeze type supports,
22 use standard structural shapes for the supporting steel.
23

24 3.2 HANGER AND SUPPORT SPACING

25
26 A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar
27 piping specialty item.
28

29 B. Where several pipes can be installed in parallel and at the same elevation, provide
30 multiple or trapeze hangers.
31

32 C. Support riser piping independently of connected horizontal piping.
33

34 D. Adjust hangers to obtain the slope specified in the piping section of this specification.
35

36 E. Space hangers for pipe as follows:
37

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Spacing</u>
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Thermoplastic	All sizes	6'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

44
45 3.3 VERTICAL RISER CLAMPS

46
47 A. Support vertical piping with clamps secured to the piping and resting on the building
48 structure or secured to the building structure below at each floor.
49

1 3.4 EQUIPMENT CURBS
2

3 A. Secure bottom of support flat on roof deck. Secure equipment to curb in accordance
4 with equipment manufacturer's instructions. Flashing and counter flashing by the
5 Division 07 Contractor.

6
7 B. Fill the entire void space with compressible fiberglass insulation.
8

9 3.5 PIPE PENETRATION THROUGH ROOF
10

11 A. Install at points where pipes penetrate roof. Install as shown on the drawings, as
12 detailed and according to the manufacturer's installation instructions. Flashing and
13 counterflashing by the Division 07 Contractor.
14

15
16 END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes air and water testing, adjusting and balancing for the entire project. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Description
 - e. Pre-Installation Meeting and Scheduling
 - f. Pre-Balance Conference
 - g. Submittals
2. Part 2 – Products
 - a. Instrumentation
3. Part 3 – Execution
 - a. Preliminary Procedures
 - b. Performing Testing, Adjusting and Balancing
 - c. Deficiencies

1.3 RELATED WORK

- A. Section 23 05 00 Common Work Results for HVAC
- B. Section 23 07 00 HVAC Insulation
- C. Section 23 09 14 Pneumatic and Electric Instrumentation and Control Devices for HVAC
- D. Section 23 09 23 Direct Digital Control System for HVAC

1.4 REFERENCE STANDARDS

- A. AABC National Standards for Total System Balance, Sixth Edition, 2002.
- B. ASHRAE ASHRAE Handbook, 2015 HVAC Applications, Chapter 38, Testing Adjusting and Balancing.
- C. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.
- D. TABB Tab Procedural Guide, First Edition, 2003.

1 1.5 DESCRIPTION
2

- 3 A. The Contractor will separately contract with an independent test and balance agency
4 to perform all testing, adjusting, and balancing of air systems required for this project.
5 Work related to the testing, adjusting, and balancing that must be performed by the
6 installing mechanical contractor is specified in other section of these specifications.
7
- 8 B. Provide total mechanical systems testing, adjusting and balancing. Requirements
9 include the balance of air distribution, adjustment of systems and equipment to
10 provide design requirements indicated on the drawings, electrical measurement and
11 verification of performance of all mechanical equipment, all in accordance with
12 standards published by AABC, NEBB, or TABB.
13
- 14 C. Test, adjust and balance all systems so that each room, piece of equipment or terminal
15 device meets the design requirements indicated on the drawings and in the
16 specifications.
17
- 18 D. Accomplish testing, adjusting and balancing work in a timely manner that allows
19 partial occupancy of major buildings, occupancy of one building when the project
20 involves many buildings, and completion of the entire project in the time stated in the
21 Instruction to Bidders and in accordance with the completion schedule established for
22 this project.
23
- 24 E. Verify that provisions are being made to accomplish the specified testing, adjusting
25 and balancing work. If problems are found, handle as specified in Part 3 under
26 Deficiencies.
27

28 1.6 QUALITY ASSURANCE
29

- 30 A. Qualifications
- 31 1. An independent Firm specializing in the Testing and Balancing of HVAC
32 systems for a minimum of 3 years. A Firm not engaged in the commerce of
33 furnishing or providing equipment or material generally related to HVAC work
34 other than that specifically related to installing Testing and Balancing
35 components necessary for work in this section such as, but not limited to sheaves,
36 pulleys, and balancing dampers.
 - 37 2. A certified member of AABC or certified by NEBB or TABB in the specific area
38 of work performed. Maintain certification for the entire duration of the project. If
39 certification of firm or any staff performing work is terminated or expires during
40 the duration of the project, contact A/E immediately.
 - 41 3. Technicians on this project must have satisfactorily completed work on a
42 minimum of (3) three projects of at least 50% in size, and of similar complexity.
43 Size is defined as the quantity of each specific individual item requiring testing
44 and balancing such as, but not limited to, equipment, devices, terminal devices,
45 and grilles and diffusers.
 - 46 4. Submit Qualifications of firm and project staff to A/E and Owners
47 Representative when requested.
48

1 1.7 PRE-INSTALLATION MEETING AND SCHEDULING
2

- 3 A. The test and balance agency is required to attend a pre-installation meeting with all
4 other project contractors before the construction process is started. The test and
5 balance agency shall give the Mechanical Contractor a detailed schedule of testing
6 and balancing tasks for incorporation into the project schedule.

7 1.8 PRE-BALANCE CONFERENCE
8

- 9 A. 90 days prior to beginning testing, adjusting and balancing, schedule and conduct a
10 conference with the Architect/Engineer, Owners Project Representative and the
11 mechanical system and temperature control system installing Contractors. Provide
12 AE and Commissioning Provider (CxP) with a complete copy of the TAB plan for the
13 project. The objective is final coordination and verification of system operation and
14 readiness for testing, adjusting and balancing procedures and scheduling procedures
15 with the above mentioned parties. Indicate work required to be completed prior to
16 testing, adjusting, and balancing and identify the party responsible for completion of
17 that work.
18

19 1.9 SUBMITTALS
20

- 21 A. See also Related Work in this section.
22
- 23 B. Submit testing, adjusting and balancing reports bearing the seal and signature of the
24 NEBB, AABC or TABB Certified Test and Balance Supervisor. The reports certify
25 that the systems have been tested, adjusted and balanced in accordance with the
26 referenced standards; are an accurate representation of how the systems have been
27 installed and are operating; and are an accurate record of all final quantities measured
28 to establish normal operating values of the systems.
29
- 30 C. Format:
31 1. Cover page identifying project name, project number and descriptive title of
32 contents. Divide the contents of the report into the below listed divisions:
33 a. General Information
34 b. Summary
35 c. Air Systems
36
- 37 D. Contents: Provide the following minimum information, forms and data:
38 1. General Information: Inside cover sheet identifying Test and Balance Agency,
39 Contractor, Architect, Engineer, Project Name and Project Number. Include
40 addresses, contact names and telephone numbers. Also include a certification
41 sheet containing the seal and signature of the Test and Balance Supervisor.
42 2. Summary: Provide summary sheet describing mechanical system deficiencies.
43 Describe objectionable noise or drafts found during testing, adjusting and
44 balancing. Provide recommendations for correcting unsatisfactory performances
45 and indicate whether modifications required are within the scope of the contract,
46 are design related or installation related. List instrumentation used during
47 testing, adjusting and balancing procedures.

- 1 3. The remainder of the report to contain the appropriate standard NEBB, AABC, or
2 TABB forms for each respective item and system. Fill out forms completely.
3 Where information cannot be obtained or is not applicable indicate same.
4

5
6 **PART 2 PRODUCTS**

7
8 **2.1 INSTRUMENTATION**

- 9
10 A. Provide all required instrumentation to obtain proper measurements. Application of
11 instruments and accuracy of instruments and measurements to be in accordance with
12 the requirements of NEBB, AABC, or TABB Standards and instrument
13 manufacturer's specifications.
14
15 B. All instruments used for measurements shall be accurate, and calibration histories for
16 each instrument to be available for examination by A/E upon request. Calibration and
17 maintenance of all instruments to be in accordance with the requirements of NEBB,
18 AABC, or TABB Standards
19

20
21 **PART 3 EXECUTION**

22
23 **3.1 PRELIMINARY PROCEDURES**

- 24
25 A. Review preconstruction meeting report, applicable construction bulletins, applicable
26 change orders and approved shop drawings of equipment, outlets/inlets and
27 temperature controls.
28
29 B. Check filters for cleanliness, dampers for correct positioning, equipment for proper
30 rotation and belt tension and temperature controls for completion of installation.
31
32 C. Notify Owners Project Representative on a daily basis during balancing. Identify
33 deficiencies preventing completion of testing, adjusting and balancing procedures. Do
34 not proceed until systems are fully operational with all components necessary for
35 complete testing, adjusting and balancing. Installing Contractors are required to
36 provide personnel to check and verify system completion, readiness for balancing and
37 assist Balancing Agency in providing specified system performance.
38

39 **3.2 PERFORMING TESTING, ADJUSTING AND BALANCING**

- 40
41 A. Perform testing, adjusting and balancing procedures on each system identified, in
42 accordance with the detailed procedures outlined in the referenced standards except as
43 may be modified below.
44
45 B. Unless specifically instructed in writing, all work in this specification section is to be
46 performed during the normal workday.
47
48 C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace
49 tile when work is complete and provide new tile for any tile that are damaged by this

- 1 procedure. If the ceiling construction is such that access panels are required for the
2 work of this section and the panels have not been provided, inform the owner's project
3 representative.
4
- 5 D. Cut insulation and ductwork for installation of test probes to the minimum extent
6 necessary for adequate performance of procedures. Patch using materials identical to
7 those removed, maintaining vapor barrier integrity and pressure rating of systems.
8
- 9 E. In air systems employing filters, blank off sufficient filter area to simulate a pressure
10 drop that is midway between that of a clean filter and that of a dirty filter.
11
- 12 F. Measure and record system measurements at the fan to determine total flow. Adjust
13 equipment as required to yield specified total flow at terminals. Proceed taking
14 measurements in mains and branches as required for final terminal balancing.
15 Perform terminal balancing to specified flows balancing branch dampers, deflectors,
16 extractors and valves prior to adjustment of terminals.
17
- 18 G. Measure and record static air pressure conditions across fans, coils and filters.
19 Indicate in report if cooling coil measurements were made on a wet or dry coil and if
20 filter measurements were made on a clean or dirty filter. Spot check static air pressure
21 conditions directly ahead of terminal units.
22
- 23 H. Adjust outside air, return air and relief air dampers for design conditions at both the
24 minimum and maximum settings and record both sets of data. Balance modulating
25 dampers at extreme conditions and record both sets of data. Balance variable air
26 volume systems at maximum air flow rate, full cooling, and minimum flow rate, full
27 heating; record all data.
28
- 29 I. Adjust register, grille and diffuser vanes and accessories to achieve proper air
30 distribution patterns and uniform space temperatures free from objectionable noise
31 and drafts within the capabilities of the installed system.
32
- 33 J. Provide fan and motor drive sheave adjustments necessary to obtain design
34 performance. Provide drive changes specifically noted on drawings, if any. If work
35 of this section indicates that any drive or motor is inadequate for the application,
36 advise the owner's project representative by giving the representative properly sized
37 motor/drive information (in accordance with manufacturers original service factor and
38 installed motor horsepower requirements); Confirm any change will keep the duct
39 system within its design limitations with respect to speed of the device and pressure
40 classification of the distribution system. Required motor/drive changes not
41 specifically noted on drawings or in specifications will be considered an extra cost and
42 will require an itemized cost breakdown submitted to owner's project representative.
43 Prior authorization is needed before this work is started.
44
- 45 K. Areas or rooms designed to maintain positive, negative or balanced air pressures with
46 respect to adjacent spaces, as indicated by the design air quantities, require special
47 attention. Adjust fan drives, distribution dampers, terminals and controls to maintain
48 indicated pressure relationship.
49

- 1 L. Final air system measurements to be within the following range of specified cfm:
2 1. Fans 0% to +10%
3 2. Supply grilles, registers, diffusers 0% to +10%
4 3. Return/exhaust grilles, registers 0% to -10%
5
6 M. Contact the temperature control Contractor for assistance in operation and adjustment
7 of controls during testing, adjusting and balancing procedures. Cycle controls and
8 verify proper operation and setpoints. Include in report description of temperature
9 control operation and any deficiencies found.
10
11 N. Permanently mark equipment settings, including damper and valve positions, control
12 settings, and similar devices allowing settings to be restored. Set and lock memory
13 stops.
14
15 O. Leave systems in proper working order, replacing belt guards, closing access doors
16 and electrical boxes, and restoring temperature controls to normal operating settings.
17
18 P. Coordinate furnace minimum outside air set points with the Temperature Control
19 Contractor.

20
21 3.3 DEFICIENCIES

- 22
23 A. Division 23 00 00 contractor to correct any installation deficiencies found by the test
24 and balance agency that were specified and/or shown on the Contract Documents to
25 be performed as part of that division of work. Test and balance agency will notify the
26 A/E of these items and instructions will be issued to the Division 23 00 00 contractor
27 for correction of the deficient work. All corrective work to be done at no cost to the
28 Owner or A/E. Retest mechanical systems, equipment, and devices once corrective
29 work is complete as specified.
30

31
END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Description
 - f. Definitions
 - g. Shop Drawings
 - h. Operation and Maintenance Data
 - i. Environmental Requirements
2. Part 2 – Products
 - a. Materials
 - b. Insulation Types
 - c. Adhesives, Mastics, Sealants, and Reinforcing Materials Jackets
 - d. Accessories
3. Part 3 – Execution
 - a. Examination
 - b. Installation
 - c. Protective Jacket Installation
 - d. Piping, Valve and Fitting Insulation
 - e. Piping Protective Jackets
 - f. Removable Insulation Blankets
 - g. Pipe Insulation Schedule
 - h. Duct Insulation
 - i. Ductwork Protective Coverings
 - j. Duct Insulation Schedule
 - k. Equipment Insulation
 - l. Equipment Insulation Schedule

1.3 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC
- B. Section 23 11 00 - Facility Fuel Piping
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

1 D. Section 23 31 00 - HVAC Ducts and Casings

2
3 1.4 REFERENCE STANDARDS

4
5 A. ASTM International

- 6 1. ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate
7 2. ASTM C165 Test Method for Compressive Properties of Thermal Insulations
8 3. ASTM C177 Heat Flux and Thermal Transmission Properties
9 4. ASTM C195 Mineral Fiber Thermal Insulation Cement
10 5. ASTM C240 Cellular Glass Insulation Block
11 6. ASTM C302 Density of Preformed Pipe Insulation
12 7. ASTM C272 Water Absorption of Core Materials for Sandwich Constructions
13 8. ASTM C303 Density of Preformed Block Insulation
14 9. ASTM C355 Test Methods for Test for Water Vapor Transmission of Thick
15 Materials
16 10. ASTM C518 Heat Flux and Thermal Transmission Properties
17 11. ASTM C534 Preformed Flexible Elastomeric Thermal Insulation
18 12. ASTM C552 Cellular Glass Block and Pipe Thermal Insulation
19 13. ASTM C591 Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal
20 Insulation
21 14. ASTM C610 Expanded Perlite Block and Thermal Pipe Insulation
22 15. ASTM C921 Properties of Jacketing Materials for Thermal Insulation
23 16. ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation
24 17. ASTM C1728 Standard for Aerogel Insulation
25 18. ASTM D412 Standard Test Methods for Vulcanized Rubber and
26 Thermoplastic Elastomers-Tension
27 19. ASTM D1000 Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for
28 Electrical and Electronic Applications
29 20. ASTM D1621 Standard Test Method for Compressive Properties Of Rigid
30 Cellular Plastics
31 21. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular
32 Plastics
33 22. ASTM D1940 Method of Test for Porosity of Rigid Cellular Plastics
34 23. ASTM D2126 Method for Response of Rigid Cellular Plastics to Thermal and
35 Humid Aging
36 24. ASTM D2240 Standard Test Method for Rubber Property—Durometer
37 Hardness
38 25. ASTM D5590 Test Method for Determining the Resistance of Coatings to
39 Fungal Defacement
40 26. ASTM E84 Surface Burning Characteristics of Building Materials
41 27. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop
42 Systems

43 B. MICA National Commercial & Industrial Insulation Standards

44 C. NFPA 225 Surface Burning Characteristics of Building Materials

45
46
47
48 D. UL 723 Surface Burning Characteristics of Building Materials

1 1.5 QUALITY ASSURANCE

- 2
- 3 A. Refer to Division 1, General Conditions, Equals and Substitutions
- 4
- 5 B. Label all insulating products delivered to the construction site with the manufacturer's
- 6 name and description of materials.
- 7
- 8 C. Insulation systems shall be applied by experienced contractors. Within the past five
- 9 (5) years, the contractor shall be able to document the successful completion of a
- 10 minimum of three (3) projects of at least 50% of the size and similar scope of the
- 11 work specified in this section.
- 12

13 1.6 DESCRIPTION

- 14
- 15 A. Furnish and install all insulating materials and accessories as specified or as required
- 16 for a complete installation. The following types of insulation are specified in this
- 17 section:
- 18 1. Pipe Insulation
- 19 2. Duct Insulation
- 20 3. Equipment Insulation
- 21
- 22 B. Install all insulation in accordance with the latest edition of MICA (Midwest
- 23 Insulation Contractors Association) Standard and manufacturer's installation
- 24 instructions. Exceptions to these standards will only be accepted where specifically
- 25 modified in these specifications, or where prior written approval has been obtained
- 26 from the DFD Project Representative.
- 27

28 1.7 DEFINITIONS

- 29
- 30 A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and
- 31 crawl spaces. All other areas, including walk-through tunnels, shall be considered as
- 32 exposed.
- 33

34 1.8 SHOP DRAWINGS

- 35
- 36 A. Refer to division 1, General Conditions, Submittals.
- 37
- 38 B. Submit a schedule of all insulating materials to be used on the project, including
- 39 adhesives, fastening methods, fitting materials along with material safety data sheets
- 40 and intended use of each material. Include manufacturer's technical data sheets
- 41 indicating density, thermal characteristics, jacket type, and manufacturer's installation
- 42 instructions.
- 43

44 1.9 OPERATION AND MAINTENANCE DATA

- 45
- 46 A. All operations and maintenance data shall comply with the submission and content
- 47 requirements specified under section GENERAL REQUIREMENTS.
- 48

1 1.10 ENVIRONMENTAL REQUIREMENTS

- 2
3 A. Do not store insulation materials on grade or where they are at risk of becoming wet.
4 Do not install insulation products that have been exposed to water.
5
6 B. Protect installed insulation work with plastic sheeting to prevent water damage.
7
8

9 PART 2 PRODUCTS

10
11 2.1 MATERIALS

- 12
13 A. Manufacturers: Armacell, CertainTeed, Manson, Childers, Dow, Extol, Fibrex,
14 Halstead, Foster, Imcoa, Johns Manville, Knauf, Owens-Corning, , Pittsburgh
15 Corning, VentureTape or approved equal.
16
17 B. Materials or accessories containing asbestos will not be accepted.
18
19 C. Use composite insulation systems (insulation, jackets, sealants, mastics, and
20 adhesives) that have a flame spread rating of 25 or less and smoke developed rating of
21 50 or less, with the following exceptions:
22 1. Pipe insulation which is not located in an air plenum may have a flame spread
23 rating not over 25 and a smoke developed rating no higher than 450 when tested
24 in accordance with UL 723 and ASTM E84.
25

26 2.2 INSULATION TYPES

- 27
28 A. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin
29 proof. Insulation shall be suitable to receive jackets, adhesives and coatings as
30 indicated.
31
32 B. Flexible Fiberglass Insulation
33 1. Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not
34 more than 0.30 at 75 degrees F, rated for service to 250 degrees F.
35
36 C. Rigid Fiberglass Insulation
37 1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not
38 more than 0.23 at 75 degrees F, 0.25 at 125 degrees F, 0.27 at 150 degrees F,
39 0.29 at 200 degrees F, 0.32 at 250 degrees F, minimum compressive strength of
40 25 PSF at 10% deformation, rated for service to 450 degrees F.
41
42 D. Elastomeric Insulation:
43 1. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal
44 conductivity of not more than 0.27 at 75 degrees F, minimum compressive
45 strength of 4.5 psi at 25% deformation, maximum water vapor permeability of
46 0.17 perm inch, maximum water absorption of 6% by weight, rated for service
47 range of -20 degrees F to 220 degrees F on piping and 180 degrees F where
48 adhered to equipment.
49

1 2.3 ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS

2
3 A. Products shall be compatible with surfaces and materials on which they are applied,
4 and shall be suitable for use at operating temperatures of systems to which they are
5 applied.

6
7 B. Fiberglass Insulation Adhesive

8 1. Must comply with ASTM C916, Type II: Foster 85-60, Childers CP-127, Duro
9 Dyne SSG.

10
11 C. Metal Jacketing Sealant For All Aluminum Jacketing

12 1. Foster 95-44 Elastolar, Childers CP-76 Chil-Byl, Pittsburgh Corning 727.

13
14 D. Insulation Joint Sealant (cellular glass, polyisocyanurate, phenolic)

15 1. Used on all below ambient piping to prevent moisture ingress. Foster 95-50
16 Flextra, Childers CP-76 Chil-Byl, Pittsburgh Corning CW Sealant.

17
18 2.4 JACKETS

19
20 A. All Service Jackets (ASJ)

21 1. Heavy duty, fire retardant material with white kraft reinforced foil vapor
22 retarding jacket, factory applied to insulation with a self-sealing pressure
23 sensitive adhesive lap, maximum permeance of .02 perms and minimum beach
24 puncture resistance of 50 units.

25
26 B. Foil Scrim All Service Jackets (FSJ)

27 1. Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum
28 permeance of .02 perms and minimum beach puncture resistance of 25 units.

29
30 C. Protective Metal Jackets (PMJ)

31 1. 0.016 inch thick aluminum or 0.010 inch thick stainless steel with safety edge for
32 indoor installations and 0.024 inch thick aluminum or 0.016 inch thick stainless
33 steel with safety edge for outdoor installations.

34
35 D. Self-Adhering Jackets (SAJ)

36 1. 5-ply, self-adhering multiple laminated waterproofing material with reflective
37 aluminum foil, high density polymer films and cold weather acrylic adhesive
38 providing zero (0.0) permeance. Minimum 6 mils material thickness, 25lb
39 puncture resistance when tested in accordance with ASTM D1000 and flame
40 spread/smoke developed rating of 10/20 when tested in accordance with UL 723.
41 2. Vapor retarding tape shall be specifically designed and manufactured for use
42 with the self-adhering jacket specified above. Tape shall be provided by the same
43 manufacturer that provides jacketing. Vapor retarding tapes used with self-
44 adhering jackets shall have a maximum permeance of 0.0 perms.

1 2.5 ACCESSORIES

- 2
- 3 A. All products shall be compatible with surfaces and materials on which they are
4 applied, and be suitable for use at operating temperatures of the systems to which they
5 are applied.
- 6
- 7 B. Adhesives, sealants, and protective finishes shall be as recommended by insulation
8 manufacturer for applications specified.
- 9
- 10 C. Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel.
11 Minimum thickness to be 0.015 inch for aluminum and 0.010 inch for stainless steel.
12
- 13 D. Tack fasteners to be stainless steel ring grooved shank tacks.
- 14
- 15 E. Staples to be clinch style.
- 16
- 17 F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
- 18 G. Finishing cement to be ASTM C449.
- 19
- 20 H. Joint sealants and metal jacketing sealants to be non-shrinking and permanently
21 flexible.
- 22
- 23 I. Vapor retarding coatings to have maximum applied water vapor permeance of 0.03
24 perms or less at 45 mils dry as tested by ASTM E96.
25

26

27 PART 3 EXECUTION

28

29 3.1 EXAMINATION

- 30
- 31 A. Verify that all piping, equipment, and ductwork are tested and approved prior to
32 installing insulation. Do not insulate systems until testing and inspection procedures
33 are completed.
- 34
- 35 B. Verify that all surfaces are clean, dry and without foreign material before applying
36 insulation materials.
37

38 3.2 INSTALLATION

- 39
- 40 A. All materials shall be installed by skilled labor regularly engaged in this type of work.
41 All materials shall be installed in strict accordance with manufacturer's
42 recommendations, building codes, and industry standards. Do not install products
43 when the ambient temperature or conditions are not consistent with the manufacturer's
44 recommendations. Surfaces to be insulated must be clean and dry.
45
- 46 B. Locate insulation and cover seams in the least visible location. All surface finishes
47 shall be extended in such a manner as to protect all raw edges, ends and surfaces of
48 insulation.
49

- 1 C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in
2 voids will not be accepted. Provide neatly beveled and coated terminations at all
3 nameplates, uninsulated fittings, or at other locations where insulation terminates.
4
5 D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
6
7 E. Use full length material (as delivered from manufacturer) wherever possible. Scrap
8 piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.
9
10 F. All pipe and duct insulation shall be continuous through walls, ceiling or floor
11 openings and through sleeves except where firestop or firesafing materials are
12 required. Vapor retarding jacket shall be maintained continuous through all
13 penetrations.
14 G. Provide a continuous unbroken moisture vapor retarding jacket on insulation applied
15 to systems noted below. Attachments to cold surfaces shall be insulated and vapor
16 sealed to prevent condensation.
17
18 H. Provide a complete vapor retarding jacket for insulation on the following systems:
19 1. Refrigerant
20 2. Insulated Duct
21 3. Cooling coil condensate.
22

23 3.3 PROTECTIVE JACKET INSTALLATION

- 24
25 A. All Service Jackets (ASJ) and Foil Scrim All Service Jackets (FSJ)
26 1. Install according to manufacturer's recommendations using factory supplied lap
27 seals and butt strip seals.
28
29 B. Protective Metal Jacket (PMJ)
30 1. Lap seams a minimum of 2 inches. Secure with metal bands for end to end joints,
31 and rivets or sheet metal screws for longitudinal joints. Rivets, screws, and
32 bands to be constructed of the same material as the jacket. Locate seams on
33 bottom for exterior applications. Seal laps with 1/8" bead of metal jacketing
34 sealant to prevent water entry.
35
36 C. Self-Adhering Jackets (SAJ)
37 1. Install according to manufacturer's recommendations. Cut allowing minimum 4"
38 overlap on ends and 6" on longitudinal joints. Align parallel to surface. Remove
39 release paper and press flat to surface to avoid wrinkles. Rub entire surface for
40 full adhesion and sealing at joint overlaps. On exterior applications, provide a
41 bead of compatible caulk along exposed edges.
42 2. Piping with self-adhering (SAJ) jackets shall have elbows, fittings, valves and
43 butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC
44 jacket (PFJ) installed over the self-adhering (SAJ) jacket may be provided with a
45 single, lapped layer of vapor retarding tape for elbows, fittings and valves under
46 the PVC jacket. Vapor retarding tape shall be compatible with the jacket material
47 used.

48

1 3.4 PIPING, VALVE, AND FITTING INSULATION

2
3 A. General

- 4 1. Install insulation with butt joints and longitudinal seams closed tightly. Provide
5 minimum 2” lap on jacket seams and 2” tape on butt joints, firmly cemented with
6 lap adhesive unless otherwise noted. Additionally secure with staples along
7 seams and butt joints.
- 8 2. On systems requiring a vapor retarding jacket, seal off all raw ends of insulation
9 and butt joints with vapor retarding mastic at intervals of not more than 20 feet
10 on piping. Coat staples, longitudinal and transverse seams with vapor retarding
11 mastic and on systems requiring vapor retarding jacket, coat insulated elbows,
12 fittings, and valves with vapor retarding mastic.
- 13 3. Install insulation continuous through pipe hangers and supports with hangers and
14 supports on the exterior of insulation. Where a vapor retarding jacket is not
15 required or where roller hangers are not being used, hangers and supports may be
16 attached directly to piping with insulation completely covering hanger or support
17 and jacket sealed at support rod penetration. Where riser clamps are required to
18 be attached directly to piping requiring vapor retarding jacket, extend insulation
19 and vapor retarding jacketing/coating around riser clamp.
- 20 4. Where insulated piping is installed on hangers and supports, the insulation shall
21 be installed continuous through the hangers and supports. High density inserts
22 shall be provided as required to prevent the weight of the piping from crushing
23 the insulation. Pipe shields are required at all support locations. The insulation
24 shall not be notched or cut to accommodate the supporting channels.

25
26 B. Fittings And Valves

- 27 1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with
28 factory molded or built up insulation of the same thickness as adjoining
29 insulation. Where the ambient temperature exceeds 150 degrees F, cover
30 insulation with fabric reinforcing and mastic. Where the ambient temperatures do
31 not exceed 150 degrees, furnish and install PVC fitting covers.

32
33 C. Elastomeric

- 34 1. Where practical, slip insulation on piping during pipe installation when pipe ends
35 are open. Miter cut fittings allowing sufficient length to prevent stretching.
36 Completely seal seams and joints for vapor tight installation. For elastomeric
37 insulation, apply full bed of adhesive to both surfaces. For polyolefin, seal
38 factory preglued seams with roller and field seams and joints with full bed of hot
39 melt polyolefin glue to both surfaces. Cover elastomeric insulation on systems
40 operating below 40 degrees F with vapor retarding mastic.

41
42 3.5 PIPING PROTECTIVE JACKETS

- 43
44 A. In addition to the jackets specified in the pipe insulation schedule below the following
45 protective jackets are required:
- 46
47 B. Provide a protective metal (PMJ) or self-adhering (SAJ) jacket for the following
48 insulated piping:
- 49 1. Exterior installed refrigeration piping.

3.6 PIPE INSULATION SCHEDULE

A. Provide insulation on new piping as indicated in the following schedule:

SERVICE	INSULATION	JACKET	INSULATION THICKNESS BY PIPE SIZE				
			< 1"	1" to < 1-1/2"	1-1/2" to < 4"	4" to < 8"	8" and Larger
Cooling Coil Condensate Drain	Rigid Fiberglass	ASJ	0.5"	0.5"	1"	1"	1"
Refrigerant Piping	Elastomeric	PMJ/SAJ	1.5"	1.5"	1.5"	1.5"	1.5"

3.7 DUCT INSULATION

A. General

1. Secure flexible duct insulation on sides and bottom of ductwork over 24" wide and all rigid duct insulation with weld pins. Space fasteners 18" on center or less as required to prevent sagging.
2. Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted as close as possible to the equipment surface. Pins shall be located a maximum of 3" from each edge and spaced no greater than 12" on center.
3. Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4" tape of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges and penetrations to be fully vapor sealed with vapor retarding mastic.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.
5. External supply duct insulation is not required where ductwork contains continuous 1" acoustical liner. Provide 4" overlap of external insulation over ends of acoustically lined sections.
6. Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous through the hangers. Drop the supporting channels required to facilitate the installation of the insulation. Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the ductwork from crushing the insulation.

3.8 DUCTWORK PROTECTIVE COVERINGS

A. Duct Insulation Schedule

1. Provide duct insulation on new and existing remodeled ductwork in the following schedule:

SERVICE	INSULATION TYPE	JACKET	THICKNESS
Outside air ducts	Rigid Fiberglass	FSJ	2"
Mixed air ducts	Rigid Fiberglass	FSJ	2"

Exposed supply ducts	Flexible Fiberglass	FSJ	2"
Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"
Ducts in Unconditioned Attic	Rigid Fiberglass	FSJ	3"
Exhaust and relief ducts downstream of motorized backdraft dampers	Rigid Fiberglass	FSJ	2"
Exhaust Ducts Downstream of Energy Recovery Units	Rigid Fiberglass	FSJ	2"
Louver blank-off panels	Rigid Fiberglass	FSJ	2"

1
2
3
4
5
6
7
8
9
10
11

3.9 EQUIPMENT INSULATION

A. General

1. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

3.10 EQUIPMENT INSULATION SCHEDULE:

A. Provide equipment insulation as follows:

EQUIPMENT	INSULATION TYPE	JACKET	THICKNESS
Cooling Coil Casing	Rigid Fiberglass	ASJ	2"

12
13
14

END OF SECTION

SECTION 23 09 14

ELECTRONIC INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

A. This section includes electronic instrumentation and control devices. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Point List
 - c. Related Work
 - d. Work Not Included
 - e. Quality Assurance
 - f. Reference Standards
 - g. Submittals
 - h. Demolition
 - i. Design Criteria
 - j. Operation and Maintenance Data
 - k. Material Delivery and Storage
2. Part 2 – Products
 - a. Control Dampers
 - b. Thermostat Guards
 - c. Electric/Electronic Thermostats
 - d. Temperature Control Panels
 - e. Temperature Sensors
 - f. Current Status Switches
 - g. Power Supplies
3. Part 3 – Execution
 - a. Installation
 - b. Wire Conduit and Tubing Installation Schedule
 - c. Room Thermostats and Temperature Sensors
 - d. Low Limit Thermostats (Freezestats)
 - e. Temperature Control Panels
 - f. Current Status Switches

1.3 POINT LIST (Section 23 09 15)

1.4 RELATED WORK

- A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination
- B. Section 23 09 23 - Direct Digital Control System for HVAC

- 1 C. Section 23 09 93 - Sequence of Operation
- 2
- 3 D. Section 23 33 00 - Ductwork Accessories - For Control Damper Installation
- 4
- 5 E. Division 23 - HVAC - Equipment provided to be controlled or monitored
- 6
- 7 F. Division 26 - Electrical - Installation requirements & Equipment provided to be
- 8 controlled or monitored
- 9

10 1.5 QUALITY ASSURANCE

- 11
- 12 A. Installing contractor must be a manufacturer's branch office or an authorized
- 13 representative of a Direct Digital Control (DDC) equipment manufacturer that
- 14 provides engineering and commissioning of the DDC equipment. Submit written
- 15 confirmation of such authorization from the manufacturer. Indicate in letter of
- 16 authorization that installing contractor has successfully completed all necessary
- 17 training required for engineering, installation, and commissioning of equipment and
- 18 systems and that such authorization has been in effect for a period of not less than
- 19 three years. DDC equipment may or may not be required to be installed by this
- 20 contractor as part of the project, but the intent of this quality assurance specification is
- 21 to ensure that the installing contractor has the capabilities to engineer, install, and
- 22 commission the field devices supplied under this section for temperature control.
- 23

24 1.6 REFERENCE STANDARDS

- 25
- 26 A. ANSI/ASTM B32 Specification for Solder Metal
- 27
- 28 B. ASTM D 635 Standard Test Method for Rate of Burning and/or Extent and
- 29 Time of Burning of Plastics in a Horizontal Position
- 30
- 31 C. UL 94 Tests for Flammability of Plastic Materials for Parts in Devices
- 32 and Appliances
- 33
- 34 D. AMCA 500-D Laboratory Method of Testing Dampers for Rating
- 35

36 1.7 SUBMITTALS

- 37
- 38 A. Include the following information:
- 39
- 40 B. Manufacturer's data sheets indicating model number, pressure/temperature ratings,
- 41 capacity, methods and materials of construction, installation instructions, and
- 42 recommended maintenance. General catalog sheets showing a series of the same
- 43 device is not acceptable unless the specific model is clearly marked.
- 44
- 45 C. Schematic flow diagrams of systems showing fans, dampers, and other control
- 46 devices. Each control device provided under this Section shall be uniquely labeled.
- 47 Duplicate labeling may be used within similar mechanical systems. Label each device
- 48 with setting or adjustable range of control. Indicate all wiring, clearly, differentiating

- 1 between factory and field installed wiring. Wiring should be shown in schematics that
2 detail contact states, relay references, etc. Diagrammatic representations of devices
3 alone are not acceptable.
4
- 5 D. Details of construction, layout, and location of each temperature control panel within
6 the building, including instruments location in panel and labeling. Also include on
7 drawings location of mechanical equipment controlled (room number), horsepower
8 and flow of motorized equipment (when this data is available on plans), locations of
9 all remote sensors and control devices (either by room number or column lines).
10
- 11 E. A complete description of each control sequence for equipment that is not controlled
12 by direct digital controls. Direct digital controlled equipment control sequences will
13 be provided by the DDC control contractor.
14
- 15 1.8 DEMOLITION
- 16
- 17 A. Remove all existing controls, including wiring, actuators, thermostats, conduit,
18 sensors, etc. from the building.
19
- 20 1.9 DESIGN CRITERIA
- 21
- 22 A. Size all control apparatus to properly supply and/or operate and control the apparatus
23 served.
24
- 25 B. Provide control devices subject to corrosive environments with corrosion protection or
26 construct them so they are suitable for use in such an environment.
27
- 28 C. Provide devices exposed to outside ambient conditions with weather protection or
29 construct them so they are suitable for outdoor installation.
30
- 31 D. Use only UL labeled products that comply with NEMA Standards. Electrical
32 components and installation to meet all requirements of the electrical sections
33 (Division 26) of project specifications.
34
- 35 1.10 OPERATION AND MAINTENANCE DATA
- 36
- 37 A. All operations and maintenance data shall comply with the submission and content
38 requirements specified under section GENERAL REQUIREMENTS.
39
- 40 1.11 MATERIAL DELIVERY AND STORAGE
- 41
- 42 A. Provide factory shipping cartons for each piece of equipment and control device. This
43 contractor is responsible for storage of equipment and materials inside and protected
44 from the weather.
45

1 PART 2 PRODUCTS

2
3 2.1 THERMOSTAT GUARDS

- 4
5 A. Provide clear plastic locking covers keyed the same. For locations that are subject to
6 physical abuse, provide metal guard, Johnson Controls GRD10A-601, Shaw Perkins
7 Series 16 or equal.
8

9 2.2 ELECTRIC/ELECTRONIC THERMOSTATS

10
11 A. Electric Thermostats:

- 12 1. For single setpoint applications, provide line or low voltage electric type suitable
13 for heating or heating and cooling as required. Provide the required number of
14 heating and/or cooling stages required for the application. For line voltage
15 ventilation applications utilizing fans and where otherwise specified in the
16 sequence of operations, provide an integral manual On/Off/Auto selector switch.
17 Minimum contact rating shall be equal or greater to electrical load of device
18 being controlled.
19

20 B. Low Voltage Electronic Thermostats:

- 21 1. Manufacturers: Honeywell or prior approved equal.
22 a. Where unoccupied setpoints are specified, provide electronic programmable
23 type with seven day setup/setback scheduling with a minimum of two
24 occupied and unoccupied schedules per day through keypad entry on front
25 of unit. For heating and cooling applications, provide automatic
26 heating/cooling switchover. For applications that control fans, provide fan
27 override switch. For ventilation or packaged economizer applications
28 provide a dry contact for ventilation damper or economizer initiation. For
29 thermostat control of economizer, provide a 0-10VDC modulated output for
30 economizer damper control.
31 b. For applications that require integration to the building automation system,
32 provide a BACnet communication interface. If a communication interface is
33 specified, occupancy scheduling in the thermostat is not required.
34

35 C. LOW LIMIT THERMOSTATS (Freezestats):

- 36 a. Electric two-position type with temperature sensing element and manual
37 reset for all applications except integral face and bypass steam heating coils
38 which shall have auto-reset freezestats and latching relays (see execution
39 section for details). Unit to be capable of opening control circuit if any one-
40 foot length of sensing element is subject to a temperature below the setpoint.
41 Length of sensing element to be not less than one lineal foot per square foot
42 of coil surface areas. Unless otherwise indicated, set low limit controls at
43 36°F.
44

45 2.3 TEMPERATURE CONTROL PANELS

- 46
47 A. Constructed of steel or extruded aluminum, with hinged door, keyed lock, and baked
48 enamel finish. Install controls, relays, transducers and automatic switches inside

- 1 panels. Label devices with permanent printed labels and provide asbuilt wiring/piping
2 diagram within enclosure. Provide raceways for wiring and poly within panel for neat
3 appearance. Provide termination blocks for all wiring terminations. Label outside of
4 panel with panel number corresponding to plan tags and asbuilt control drawings as
5 well as building system(s) served.
6
- 7 B. Control panels that have devices or terminations that are fed or switch 50V or higher
8 shall enclose the devices, terminations, and wiring so that Personal Protective
9 Equipment (PPE) is not required to service the under 50V devices and terminations
10 within the control panel. As an alternative, a separate panel for only the 50V and
11 higher devices may be provided and mounted adjacent to the under 50V control panel.
12
- 13 C. For panels that have 120VAC power feeds provide a resettable circuit breaker.
14 Provide label within the panel indicating circuit number of 120VAC serving panel
15

16 2.4 TEMPERATURE SENSORS

- 17
- 18 A. Thermistor temperature sensor manufacturers: PreCon, BAPI, and ACI
19
- 20 B. Use thermistor or RTD type temperature sensing elements constructed so accuracy
21 and life expectancy is not affected by moisture, physical vibration, or other conditions
22 that exist in each application.
23
- 24 C. RTD's shall be of nickel or platinum construction and have a base resistance of
25 1000Ω at 70°F and 32°F respectively. 100Ω platinum RTD's are acceptable if used
26 with temperature transmitters.
27
- 28 D. The temperature sensing device used must be compatible with the DDC controllers
29 used on the project.
30
- 31 E. RTD
- | | |
|---|---------------------|
| 32 Accuracy (Room Sensor Only) | minimum ± 1.0°F |
| 33 Accuracy (Averaging) | minimum ± 1.2°F |
| 34 Accuracy (Other than Room Sensor or Averaging) | minimum ± 0.65°F |
| 35 Range | minimum -40 - 220°F |
- 36
- 37 F. Thermistor
- | | |
|------------------------------|---------------------|
| 38 Accuracy (All) | minimum ± 0.36°F |
| 39 Range | minimum -30 - 230°F |
| 40 Heat Dissipation Constant | minimum 2.7 mW/°C |
- 41
- 42 G. Temperature Transmitter
- | | |
|-------------|----------------------------------|
| 43 Accuracy | minimum ± 0.1°F or ±0.2% of span |
| 44 Output | 4-20 mA |
- 45
- 46 H. Provide limited range or extended range sensors if required to sense the range
47 expected for a respective point. Use RTD type sensors for extended ranges beyond -

1 30 to 230°F. If RTD's are incompatible with DDC controller direct temperature input
2 use temperature transmitters in conjunction with RTD's.
3

- 4 I. Use wire size appropriate to limit temperature offset due to wire resistance to 1.0°F.
5 If offset is greater than 1.0°F due to wire resistance, use temperature transmitter. If
6 feature is available in DDC controller, compensate for wire resistance in software
7 input definition.
8

9 2.5 CURRENT STATUS SWITCHES

- 10 A. Provide a current sensor with adjustable threshold and digital output with LED
11 display, equal to a Veris model H-708/H-904. Threshold adjustment must be by a
12 multi-turn potentiometer or set by multiprocessor that will automatically compensate
13 for frequency and amperage changes associated with variable frequency drives. When
14 used on variable speed motor applications, use a current sensor that will not change
15 state due to varying speeds.
16

17 2.6 POWER SUPPLIES

- 18 A. Provide all required power supplies for transducers, sensors, transmitters and relays.
19 All low voltage transformers shall have a resettable secondary circuit breaker and be
20 listed as class 2 power supplies.
21

22
23 PART 3 EXECUTION

24
25 3.1 INSTALLATION

- 26
27 A. Install system with trained mechanics and electricians employed by the control
28 equipment manufacturer or an authorized representative of the manufacturer. Where
29 installing contractor is an authorized representative of the control manufacturer, such
30 authorization shall have been in effect for a period of no less than three years.
31
32 B. Install all control equipment, accessories, wiring, and piping in a neat and
33 workmanlike manner. All control devices must be installed in accessible locations.
34 This contractor shall verify that all control devices furnished under this Section are
35 functional and operating the mechanical equipment as specified in Section 23 09 93.
36
37 C. Label all control devices with the exception of terminal unit devices with permanent
38 printed labels that correspond to control drawings. Labeling for each device shall be
39 unique within each mechanical system. Temperature control junction and pullboxes
40 shall be identified utilizing spray painted green covers. Other electrical system
41 identification shall follow the 26 05 53 specification.
42
43 D. All control devices and electrical boxes mounted on insulated ductwork shall be
44 mounted over the insulation. Provide mounting stand-offs where necessary for
45 adequate support. Cutting and removal of insulation to mount devices directly on
46 ductwork is not acceptable. This contractor shall coordinate with the insulation
47 contractor to provide for continuous insulation of ductwork.
48

- 1 E. Mounting of electrical or electronic devices shall be protected from weather if the
2 building is not completely enclosed. This Contractor shall be solely responsible for
3 replacing any equipment that is damaged by water that infiltrates the building if
4 equipment is installed prior to the building being enclosed.
5
- 6 F. Provide all electrical relays and wiring, line and low voltage, for control systems,
7 devices and components. Install all high voltage and low voltage wiring (includes low
8 voltage cable) in metal conduit, Electrical Non-metallic Tubing (ENT), or Electrical
9 Metallic Tubing (EMT), as scheduled below and hereafter referred to generically as
10 conduit except above accessible ceilings as noted below. See Wire and Air Piping
11 Conduit Installation Schedule below for specific conduit or tubing to be used. All
12 raceways, enclosures, fittings and associated supports shall be provided and installed
13 according to the requirements set forth in Division 16, NFPA 90 (NEC) and Chapter
14 SPS 316 of the Wisconsin Administrative Code. All conduits shall be routed parallel
15 and/or perpendicular to walls and adjacent piping. Raceways shall be located to
16 maintain headroom and working clearance around equipment and devices that require
17 inspection and service.
18
- 19 G. In general, support all raceways from the building structure. No component of a
20 raceway system shall be secured to corrugated metal roof deck. Do not impose on the
21 installations of other trades. Securing conduit, rods, straps, hangers, etc. to suspended
22 ceiling components, electrical raceways, plumbing piping, HVAC piping or ductwork,
23 or their associated support systems, will not be accepted.
24
- 25 H. Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill
26 does not exceed 40%.
27
- 28 I. Where HVAC equipment control panels, or devices, do not provide for the direct
29 connection of conduits, exposed wiring may be extended to complete the final
30 connections, providing it does not exceed 18 inches in length.
31
- 32 J. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for
33 inputs. All low voltage wiring to be stranded.
34
- 35 K. Low voltage wiring can be run without conduit above accessible lay-in tile ceilings.
36 All wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations,
37 and in any exposed areas, and in all other locations shall be in conduit. Wire for wall
38 sensors shall be run in conduit.
39
- 40 L. Where wiring is installed free-air, installation shall comply with the following:
41
- 42 1. Wiring shall run at right angles and be kept clear of other trades work.
 - 43 2. Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings
44 anchored to ceiling concrete, piping supports, walls above ceiling or structural
45 steel beams. Mounting rings shall be of open design (not a closed loop) to allow
46 additional wire to be strung without being threaded through the ring. For
47 mounting rings that do not completely surround the wire, attach the wire to the
48 mounting ring with a strap.

- 1 3. At HVAC terminal units only, where the wiring serves a specific device; e.g.
2 controller, actuator, transmitter, etc. associated with the unit, the j-hooks or
3 Bridal rings required to support the wiring, may be secured to the rods or straps
4 that support the ductwork or piping that serves the unit. Wall penetrations shall
5 be sleeved.
6 4. Supports shall be spaced at a maximum 4-foot interval unless limited by building
7 construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall
8 be used.
9 5. Wall penetrations shall be sleeved and fire stopped as specified.
10
11 M. Install "hand/off/auto" selector switches on systems where automatic interlock
12 controls are specified and "hand/off/auto" selector switches are not supplied with the
13 equipment controlled. Control panel power will not be required for "hand" switch to
14 operate. When switch is in "hand" position, allow manual operation of the selected
15 device without operating the interlocked motors but allowing all unit safety devices to
16 stay in the circuit.
17
18 N. All wiring in control panels shall be terminated on a terminal strip. Wire nuts are not
19 acceptable. A maximum of two wires shall be terminated under any one terminal.
20
21 O. All electrical wiring are to be permanently tagged or labeled within one inch of
22 terminal strip with a numbering system to correspond with the "Record Drawings".
23
24 P. After completion of installation, test and adjust control equipment. Submit data
25 showing set points and final adjustments of controls.
26

27 3.2 WIRE CONDUIT AND TUBING INSTALLATION SCHEDULE

- 28
29 A. The following conduit schedule shall apply to wire in conduit where conduit is
30 specified for air tubing or wiring. Conduit and tubing referenced below shall meet
31 specifications in Section 26 05 33 and as defined below.
32
33 B. Conduit other than that specified below for specific applications shall not be used.
34
35 C. Underground Installations within Five Feet (1.5 m) of Foundation Wall: Rigid steel
36 conduit.
37
38 D. Underground Installations More than Five Feet (1.5 m) From Foundation Wall: Rigid
39 steel conduit. Plastic-coated rigid steel conduit. Schedule 40 PVC conduit.
40
41 E. Under Slab on Grade Installations: Schedule 40 PVC conduit.
42
43 F. Exposed Outdoor Locations: Rigid steel conduit.
44
45 G. Concealed in Concrete and Block Walls: Rigid steel conduit. Schedule 40 PVC
46 conduit. Electrical Nonmetallic Tubing (ENT).
47

- 1 H. Within Concrete Slab: Rigid steel conduit. Schedule 40 PVC conduit. Electrical
2 Nonmetallic Tubing (ENT).
3
- 4 I. Wet Interior Locations: Rigid steel conduit. Schedule 40 PVC conduit.
5
- 6 J. Concealed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit.
7 Electrical metallic tubing.
8
- 9 K. Exposed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit.
10 Electrical metallic tubing.
11

12 3.3 ROOM THERMOSTATS AND TEMPERATURE SENSORS 13

- 14 A. Check and verify location of thermostats, humidistats, and other exposed control
15 sensors with plans and room details before installation. Align with light switches.
16 For drywall installations, thermostat mounting shall use a back-box attached to a wall
17 stud, drywall anchors are not acceptable.
18
- 19 B. Any room thermostats or sensors mounted on an exterior wall shall be mounted on a
20 thermally insulated sub-base. Subbase to provide a minimum of one half inch of
21 insulation.
22
- 23 C. Where thermostats or sensors are mounted on exterior walls or in any location where
24 air transfer will affect the measured temperature or humidity seal the conduit and any
25 other opening that will effect the measurement.
26
- 27 D. Provide guards on thermostats and sensors in public areas.
28

29 3.4 LOW LIMIT THERMOSTATS (Freezestats) 30

- 31 A. Install low limit controls where indicated on the drawings or as specified. Unless
32 otherwise indicated, install sensing element on the downstream side of heating coils.
33
- 34 B. Mount units using flanges and element holders. Provide duct collars or bushings
35 where sensing capillary passes through sheetmetal housings or ductwork; seal this
36 penetration to eliminate air leakage. Mount the units in an accessible location as to
37 allow for resetting after low limit trips while still meeting manufacturer's installation
38 requirements for proper function.
39
- 40 C. Distribute (serpentine) sensing element horizontally across the coil to cover every
41 square foot of coil; on larger coils this may require more than one instrument. Install
42 controls at accessible location with mounting brackets and element duct collars where
43 required.
44

45 3.5 TEMPERATURE CONTROL PANELS 46

- 47 A. Mount control panels adjacent to associated equipment on vibration-free walls or
48 freestanding angle iron supports. All control panel openings shall be plugged.

1 Conduits and other penetrations on the top of the cabinets shall be sealed on the
2 exterior of the cabinet with silicone caulk to resist water penetration. One cabinet
3 may accommodate more than one system in same equipment room. Provide
4 permanent printed labeling for instruments and controls inside cabinet and engraved
5 plastic nameplates on cabinet face.
6

7 B. Provide as-built control drawings of all systems served by each local panel in a
8 location adjacent to or inside of panel cover. Provide a protective cover or envelope
9 for drawings.

10 3.6 CURRENT STATUS SWITCHES

11
12
13 A. Provide for each fan specified, or shown on point list. Set threshold adjustment to
14 indicate belt or coupling loss. Readjust threshold for proper operation after final
15 balancing is completed.
16

17 END OF SECTION

DDC INPUT / OUTPUT SUMMARY TABLE

PROJECT: Park Edge / Park Ridge Employment Center	HARDWARE				SOFTWARE													Comments																				
	OUTPUT		INPUT				ALARMS				ENERGY MANAGEMENT SYSTEM FUNCTIONS																											
	DIGITAL	ANALOG	DIGITAL	ANALOG			DIGITAL	ANALOG	DIGITAL			ANALOG			Day/Night Setback	Demand Limiting	Dial-up I/O		Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend	Equipment Integration	Fire Alarm Integration	Security/Access Integration	Elect P/QM Integration	Chiller Integration	Dry-bulb Economizer	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override					
				24VAC Contactor	2-Pos Actuator	Tri-State Actuator			Duration Adjust Actuator	4-20 mA	0-10 VDC	Current Sensing Switch	Control Relay Contact	Switch Closure																				Auxiliary Contact	Diff Pressure Switch	Flow Switch	Temperature	Relative Humidity
POINT DESCRIPTION																																						
F-2 / ACCU-2 (F-3/ACCU-3)																																						
Enable / Disable Status	X					X																																
Discharge Air Temperature																		X																				
ECM Blower Motor																																						
Modulating Gas Control																																						
ACCU - 1st Stage																																						
ACCU - 2nd Stage																																						
Occ/Unocc Space Temp Setp																																						
Space Temp Override																																						
Outside Air Temperature																																						
Outside Air Enthalpy																																						
Zone Damper Control																																						
Outside Air Damper																																						
EBB Enable	X																																					
Data Room Temperature																																						

SECTION 23 09 23

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. Work in this section includes Direct Digital Control (DDC) panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete Direct Digital Control (DDC) system. This system interfaced with electric controls (Section 23 09 14) utilizing Direct Digital Control signals to operate actuated control devices will meet, in every respect, all operational and quality standards specified herein.

1. Part 1 – General

- a. Scope
- b. Related Work
- c. Reference Standards
- d. Quality Assurance
- e. Submittals
- f. Operation and Maintenance Data
- g. Material Delivery and Storage

2. Part 2 – Products

- a. General
- b. Local Control Panels
- c. Direct Digital Controls (DDC)
- d. High Pressure Ductwork (Pressure class 3 inch and over)
- e. Networking/Communications
- f. BACnet Requirements
- g. Supervisory Controllers
- h. System Software Features
- i. Programmable Controllers
- j. Application Specific Controllers- HVAC
- k. Operator Interface Requirements
- l. Operator Work Station & DDC Server
- m. Operator Work Station & DDC Server
- n. Web Based HTML Browser Interface
- o. Portable Operator Terminal
- p. ASC Portable Service Terminal

3. Part 3 – Execution

- a. General
- b. Installation
- c. Owner Training

1 1.3 RELATED WORK

2
3 A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination

4
5 B. Section 23 09 14 - Electric Instrumentation and Control Devices for HVAC

6
7 C. Section 23 09 15 - Direct Digital Control Input/Output Point Summary Tables

8
9 D. Section 23 09 93 - Control

10
11 E. Division 23 - HVAC - Equipment provided to be controlled or monitored

12
13 F. Division 26 - Electrical - Equipment provided to be controlled or monitored

14
15 1.4 REFERENCE STANDARDS

16
17 A. FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio
18 Communication Interference

19
20 1.5 QUALITY ASSURANCE

21
22 A. MANUFACTURERS:

- 23 1. Honeywell is the only approved control manufacturer. Additionally, controllers
24 by Tridium are acceptable.

25
26 1.6 INSTALLER

27
28 A. A firm specializing and experienced in DDC control system installation for no less
29 than 3 years. All engineering and commissioning work shall be done by qualified
30 employees of this manufacturer, or qualified employees of an Authorized
31 Representative of that manufacturer that provides engineering and commissioning of
32 the manufacturer's control equipment. Where installing contractor is an authorized
33 representative of the control equipment manufacturer, submit written confirmation of
34 such authorization. Indicate in letter of authorization that the installing contractor has
35 successfully completed all necessary training required for the engineering, installation,
36 and commissioning of equipment and systems to be provided for the project and that
37 such authorization has been in effect for a period of not less than three years. The
38 letter of authorization should also indicate that the installing contractor is authorized
39 to install the manufacturer's DDC equipment at the project location at the time the
40 project is bid. Installation of the equipment shall be done by qualified mechanics
41 and/or electricians in the direct employ or be directly subcontracted and under the
42 supervision of the manufacturer or Authorized Representative. The contractor
43 providing and installing the equipment under this specification section shall be the
44 same contractor providing and installing equipment under the 23 09 14 specification
45 section.

46
47 B. RESPONSE TIME:

- 48 1. During warrantee period, four (4) hours or less, 24-hours/day, 7 days/week.

1 1.7 ELECTRICAL STANDARDS
2

- 3 A. Provide electrical products, which have been tested, listed and labeled by
4 Underwriters' Laboratories (UL) and comply with NEMA standards.
5

6 1.8 DC STANDARDS
7

- 8 A. DDC manufacturer shall provide written proof with shop drawings that the equipment
9 being provided is in compliance with F.C.C. rules governing the control of
10 interference caused by Digital Electronic Equipment to Radio Communications (Part
11 15, Subpart J, Class A).
12

13 1.9 SUBMITTALS
14

- 15 A. Include the following information:
16 1. Details of construction, layout, and location of each temperature control panel
17 within the building, including instruments location in panel and labeling.
18 Indicate which piece of mechanical equipment is associated with each controller
19 and what area within the building is being served by that equipment. For
20 terminal unit control, provide a room schedule that would list mechanical
21 equipment tag, room number of space served, address of DDC controller, and
22 any other pertinent information required for service.
23

24 1.10 PRODUCT DATA
25

- 26 A. Submit manufacturer's specifications for each control device furnished, including
27 installation instructions and startup instructions. General catalog sheets showing a
28 series of the same device is not acceptable unless the specific model is clearly marked.
29 Annotated software program documentation shall be submitted for system sequences,
30 along with descriptive narratives of the sequence of operation of the entire system
31 involved. Submit wiring diagram for each electrical control device along with other
32 details required to demonstrate that the system has been coordinated and will function
33 as a system.
34

35 1.11 MAINTENANCE DATA
36

- 37 A. Submit maintenance data and spare parts lists for each control device. Include this
38 data in maintenance manual.
39

40 1.12 RECORD DRAWINGS
41

- 42 A. Prior to request for final payment provide complete composite record drawings to
43 incorporate the DDC and Pneumatic/Electric field work. All software addressing for
44 device communication shall be noted for all devices provided under this section and
45 the communication addressing required for devices provided by others that are
46 integrated into the direct digital control system provided under this section. Point to
47 point routing of communication trunks and power wiring between DDC controllers,
48 DDC communication devices, control panels, and Ethernet switches shall be
49 documented. Coordinate with the supplier of the equipment specified to be interfaced

1 through digital communications for communication addressing. Provide circuit
2 number of 120VAC panel power circuit(s) feeding each control panel on record
3 drawings. Label circuit number(s) inside the panel served.
4

5 1.13 OPERATION AND MAINTENANCE DATA
6

- 7 A. All operations and maintenance data shall comply with the submission and content
8 requirements specified under section GENERAL REQUIREMENTS
9

10 1.14 MATERIAL DELIVERY AND STORAGE
11

- 12 A. Provide factory shipping cartons for each piece of equipment and control device. This
13 contractor is responsible for storage of equipment and materials inside and protected
14 from the weather.
15

16
17 PART 2 – PRODUCTS
18

19 2.1 GENERAL
20

- 21 A. Provide DDC control products in sizes and of capacities as required, conforming to
22 manufacturer's standard materials and components as published in their product
23 information, designed and constructed as recommended by the manufacturer and as
24 required for application indicate.
25
26 B. System shall be capable of operating with 120 VAC power supply, fully protected
27 with a shutdown-restart circuit, and associated hardware and software.
28

29 2.2 LOCAL CONTROL PANELS
30

- 31 A. Use control panels with suitable mounting brackets for each supply fan system. Locate
32 panel adjacent to system served.
33
34 B. Fabricate panels of 14 gauge furniture grade steel or 6063-T5 extruded aluminum
35 alloy, totally enclosed on six sides, hinged door and keyed lock, with manufacturer's
36 standard shop painted finish and color.
37
38 C. Provide UL listed cabinets for use with line voltage devices.
39
40 D. Control panels that have devices or terminations that are fed or switch 50V or higher
41 shall enclose the devices, terminations, and wiring so that Personal Protective
42 Equipment (PPE) is not required to service the under 50V devices and terminations
43 within the control panel. As an alternative, a separate panel for only the 50V and
44 higher devices may be provided and mounted adjacent to the under 50V control panel.
45
46 E. Plastic control enclosures will be approved provided all conduits are bonded and
47 grounded.
48

- 1 F. Provide control panels for all DDC Controllers, ASC's and associated function
2 modules. All controls to be in control panels.
3
4 G. All wiring for controllers shall be managed in a neat and workmanlike manner.
5
6 H. Permanently label all controls; tag all control wiring, and document both on control
7 drawings.
8

9 2.3 DIRECT DIGITAL CONTROLS

- 10
11 A. System to be capable of integrating multiple building functions, including equipment
12 supervision and control, alarm management, energy management, and trend data
13 collection.
14
15 B. DDC to consist of Supervisory Controllers, Programmable Controllers, stand-alone
16 Application Specific Controllers (ASC's), DDC system servers, and other operator
17 interface devices.
18
19 C. The system shall be modular in nature, and shall permit expansion of both capacity
20 and functionality through the addition of sensors, actuators, ASC's, and operator
21 devices.
22
23 D. The failure of any single component or network connection shall not interrupt the
24 execution of control strategies at other operational devices.
25

26 2.4 NETWORKING COMMUNICATIONS

- 27
28 A. The design of the DDC shall be networked. The highest level networking shall use
29 Ethernet and the sub-level networking shall use serial communications. Inherent in
30 the system's design shall be the ability to expand or modify the highest network either
31 via a local area network (LAN), wide area network (WAN), or a combination of the
32 two schemes.
33
34 B. The highest-level DDC communications network shall be capable of direct connection
35 to and communication with a high-speed LAN or WAN utilizing an Ethernet
36 connection. Communication protocol used shall be BACnet/IP.
37
38 C. The supervisory controller shall directly oversee a local network such that
39 communications may be executed directly to and between programmable controllers
40 and ASC's. All operator devices, either network resident or connected via dial-up
41 modems, shall have the ability to access all points and application reports on the
42 network.
43
44 D. Provide serial communication ports on all ASC's for operator's terminal
45 communications with the DDC Controller.
46
47 E. Access to system data shall not be restricted by the hardware configuration of the
48 DDC system.
49

- 1 F. Global data sharing or global point broadcasting shall allow point data to be shared
2 between programmable controllers and ASC's when it would be impractical to locate
3 multiple sensors.
4
- 5 G. Network design shall include the following provisions:
6 1. Data transfer rates for alarm reporting and quick point status from multiple
7 programmable controllers and ASC's. The minimum baud rate shall be 9600
8 baud.
9 2. Support of any combination of programmable controllers and ASC's. A
10 minimum of 32 programmable controllers and ASC's shall be supported on a
11 single local network. The buss shall be addressable for up to 32 ASC's.
12 3. Detection of single or multiple failures of ASC's or the network media.
13 4. Error detection, correction, and re-transmission to guarantee data integrity.
14 5. Use commonly available, multiple-sourced, networking components.
15 6. Use of an industry standard communication transport, such as, ARCNET,
16 Ethernet, and IEEE RS-485 communications interface.
17
- 18 H. Provide a temporary Ethernet network for communications between supervisory
19 controllers and operator workstation until the building IT network is available for use
20 by the DDC system. The temporary Ethernet network and all other communications
21 required for the DDC system shall be installed as required for specified operation of
22 mechanical equipment so check out and commissioning of the equipment can occur in
23 a timely manner.
24

25 2.5 BACNET REQUIREMENTS

- 26
- 27 A. BACnet of highest level network communications will utilize BACnet/IP over
28 Ethernet and field level communications shall utilize BACnet MSTP. No other
29 communication protocol is acceptable.
30
- 31 B. All controllers shall provide a Protocol Implementation Conformance Statement
32 (PICS) and BACnet Interoperability Building Blocks (BIBB'S) as required by the
33 American National Standards Institute/American Society of Heating, Refrigerating,
34 and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 135-2001, BACnet
35 protocol.
36
- 37 C. In general, all devices shall support the following:
38 1. Segmentation Capability
39 2. Segmentation requests supported
40 3. Segmentation responses supported
41
- 42 D. Standard Object Types Supported
43 1. Analog input
44 2. Analog output
45 3. Analog value
46 4. Binary input
47 5. Binary output
48
- 49 E. Standard Object Types Supported

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 - 49
1. Analog input
 2. Analog output
 3. Analog value
 4. Binary input
 5. Binary output
 6. Binary value
 7. Calendar
 8. Device
 9. Event enrollment
 10. Group
 11. Multistate input
 12. Multistate output
 13. Multistate value
 14. Notification class
 15. Schedule
- F. Character Sets supported
1. ANSI X3.4
 2. ISO 10646 Universal Character Set-2
- G. All highest level networked supervisory devices shall support the following:
- H. Data Link Layer Option
1. BACnet Internet Protocol (IP) (Annex J)
- I. Networking Options: BACnet/IP Broadcast Management Device (BBDM)
- J. BACnet object name and description shall match the naming conventions used by the Owner. Coordinate with Owner control personnel to establish the naming conventions prior to programming of any controllers provided under this specification section. All controllers shall have object names, descriptions, and engineering units that are writable at the controller level and shall be programmed so that the object names, descriptions, and engineering units match the desired naming standards as specified above. Ensure that the BACnet object attributes for object
- ## 2.6 SUPERVISORY CONTROLLERS
- A. Supervisory controllers shall be microprocessor-based, multi-tasking, multi-user and digital control processors.
- B. Each supervisory controller shall have sufficient memory to support its own operating system and databases including:
1. Control processes
 2. Energy management application
 3. Alarm management
 4. Trend data
 5. Maintenance support applications
 6. Operator I/O
 7. Dial-up communications

1 8. Manual override monitoring
2

- 3 C. The system shall be modular in nature, and shall permit easy expansion through the
4 addition of field controllers, sensors, and actuators.
5
- 6 D. Supervisory controllers shall provide at least two RS-232C or USB serial
7 communication ports or Ethernet ports for simultaneous operation of multiple operator
8 I/O devices, such as laptop computers, personal computers, and video display
9 terminals.
10
- 11 E. Supervisory controllers shall monitor the status of all overrides and include this
12 information in the logs and summaries to inform the operator that automatic control
13 has been inhibited.
14
- 15 F. Each supervisory controller shall continuously perform self-diagnostics,
16 communications diagnostics, and diagnostics of all subsidiary equipment. Supervisory
17 controllers shall provide both local and remote annunciation of any detected
18 component failures, or repeated failure to establish communication. Indication of the
19 diagnostic results shall be provided at each supervisory controller.
20
- 21 G. Isolation shall provide at all network terminations, as well as all field point
22 terminations, to suppress induced voltage transients consistent with IEEE Standard
23 587-1980. Isolation levels shall be sufficiently high to allow all signal wiring to be
24 run in the same conduit as high voltage wiring acceptable by electrical code.
25
- 26 H. In the event of the loss of normal power, there shall be an orderly shutdown of the
27 supervisory controller to prevent the loss of data base or operating system software.
28 Non-volatile memory shall be incorporated for all critical controller configuration
29 data, and battery backup shall be provided to support the real-time clock and all
30 volatile memory for a minimum of 72 hours.
31
- 32 I. Upon restoration of normal power, the supervisory controller shall automatically
33 resume full operation without manual intervention.
34
- 35 J. Should supervisory controller memory be lost for any reason, the supervisory
36 controller shall have the capability of reloading it's programming via high speed local
37 area network from the control system archive workstation or server, the local RS-
38 232C port, or telephone line dial-in.
39

40 2.7 SYSTEM SOFTWARE FEATURES
41

- 42 A. All necessary software to form a complete operating system, as described in this
43 specification, shall be provided as an integral part of the supervisory controller, and
44 shall not be dependent upon higher level computer for execution.
45
- 46 B. Control software shall include a provision for limiting the number of times that each
47 piece of equipment may be cycled within any one-hour period.
48

- 1 C. The system shall provide protection against excessive demand situations during start-
2 up periods by automatically introducing time delays between successive start
3 commands to heavy electrical loads.
4
- 5 D. Supervisory controllers shall have the ability to perform any or all of the following
6 energy management routines:
7 1. Time of day scheduling
8 2. Calendar based scheduling
9 3. Holiday scheduling
10 4. Optimal start
11 5. Optimal stop
12 6. Demand limiting
13 7. Load rolling
14 8. Heating/cooling interlock
15
- 16 E. All programs to be executed automatically without the need for operator intervention,
17 and be flexible enough to allow user customization. Programs shall be applied to
18 building equipment described in Section 23 09 93 of this specification.
19
- 20 F. Supervisory controllers shall be able to execute configured processes defined by the
21 user to automatically perform calculations and control routines.
22
- 23 G. It shall be possible to use any of the following in a configured process:
24 1. Any system-measured point data or status
25 2. Any results from other processes
26 3. Boolean logic operators (and, or)
27
- 28 H. Configured processes may be triggered based on any combination of the following:
29 1. Time of day
30 2. Calendar date
31 3. Events (e.g., point alarms)
32
- 33 I. A single process shall be able to incorporate measured or calculated data from any and
34 all other ASC's.
35
- 36 J. A single process shall be able to issue commands to points in any and all other
37 programmable controllers and ASC's on the local network.
38
- 39 K. Alarm management shall be provided to monitor, buffer, and direct alarm reports to
40 operator devices and memory files. Each supervisory controller shall perform
41 distributed; independent alarm analysis and filtering to minimize network traffic and
42 prevent alarms from being lost. At no time shall the ability of supervisory controllers
43 to report alarms be affected by either operator activity at the local I/O device or
44 communications with other ASC's on the network.
45
- 46 L. All alarm or point change reports shall include the English language description of
47 each point and the time and date of the occurrence.
48
49

- 1 M. The user shall be able to define the specific system reaction for each point. Alarms
2 shall be prioritized to minimize nuisance reporting and to speed operator response to
3 critical alarms. A minimum of three priority levels shall be provided. Users shall
4 have the ability to manually inhibit alarm reporting for each point.
5
- 6 N. The user shall also be able to define conditions under which point changes need to be
7 acknowledged by an operator and/or logged for analysis at a later date.
8
- 9 O. Alarms reports and messages shall be directed to an operator device.
10
- 11 P. In addition to the point's descriptor and the time and date, the user shall be able to
12 print, display or store a 60-character alarm message to more fully describe the alarm
13 condition or direct operator response.
14
- 15 Q. Each supervisory controller shall be capable of storing a library of at least 100
16 messages. Each message may be assignable to any number of points in the panel.
17
- 18 R. Data collection utility shall be provided to automatically sample, store, and display
19 system data.
20
- 21 S. Measured and calculated analog and binary data shall be assignable to user definable
22 trends for the purpose of collecting operator specified performance data over extended
23 periods of time. Sample intervals of 1 minute to 24 hours, in one minute or one hour
24 intervals, shall be provided. Each supervisory controller shall have a dedicated buffer
25 for trend data and shall be capable of storing 16 trend logs. Each trend log shall have
26 up to four points trended at 48 data samples each. Data shall be stored at the
27 supervisory controller and up-loaded to the DDC system server when archiving is
28 desired.
29
- 30 T. Supervisory controllers shall automatically sample, calculate and store consumption
31 totals on a daily, weekly, or monthly basis, user defined, for user-selected analog and
32 binary pulse input type points.
33
- 34 U. The totalization routine shall have a sampling resolution of one minute.
35
- 36 V. The user shall have the ability to define a warning limit. Unique, user specified
37 messages shall be generated when the limit is reached.
38
- 39 W. Supervisory controllers shall have the ability to count events, such as the number of
40 times a pump or fan system is cycled on and off.
41
- 42 X. The event totalization feature shall be able to store the records associated with a
43 minimum of 9,999,999 events before reset.
44

45 2.8 PROGRAMMABLE CONTROLLERS

- 46
- 47 A. Programmable controllers shall be provided with a software program that shall allow
48 the user to design flexible software algorithms for the control sequences as described
49 in Sections 23 09 14 and 23 09 93 portions of this specification.

- 1 B. Programmable controllers shall support all necessary point inputs and outputs to
2 perform the specified control sequence in a totally stand-alone fashion.
3
4 C. Each programmable controller shall perform its own limit and status monitoring and
5 analysis to maximize network performance by reducing unnecessary communications.
6
7 D. Each programmable controller shall support the use of a locally mounted status and
8 adjust panel interface to allow for the local adjustment of all setpoints, temporary
9 override of any input or output points and status of all points directly at the controller.
10 The capabilities of the locally mounted status and adjust panel shall include, but not
11 be limited to, the following information for the programmable controllers to which:
12 1. Display temperatures
13 2. Display status
14 3. Display setpoints
15 4. Display control parameters
16 5. Override binary output control
17 6. Override analog output control
18 7. Override analog setpoints
19 8. Modification of gain and offset constants
20
21 E. All system setpoints, proportional bands, control algorithms, and any other
22 programmable parameters shall be stored such that a power failure of any duration
23 does not necessitate reprogramming the programmable controller.
24

25 2.9 APPLICATION SPECIFIC CONTROLLERS – HVAC APPLICATIONS

- 26
27 A. Each supervisory controller shall be able to extend its monitoring and control through
28 the use of stand-alone application specific controllers (ASC's).
29
30 B. Each ASC shall operate as a stand-alone controller capable of performing its specified
31 control responsibilities independently of other controllers in the network. Each ASC
32 shall be a microprocessor based, multi-tasking, real-time digital control processor.
33
34 C. Each ASC shall have sufficient memory to support its own operating system and
35 databases including:
36 1. Control Processes
37 2. Operator I/O (Portable Service Terminal)
38
39 D. The operator interface to any ASC point or program shall be through the supervisory
40 controller connection to any ASC on the network.
41
42 E. ASC's shall directly support the temporary use of a portable service terminal that can
43 be connected to the ASC via zone temperature or directly at the controller. The
44 capabilities of the portable service terminal shall include, but not be limited to, the
45 following information for the:
46 1. Control Processes
47 2. Operator I/O (Portable Service Terminal)
48

- 1 F. The operator interface to any ASC point or program shall be through the supervisory
2 controller connection to any ASC on the network.
- 3 G. ASC's shall directly support the temporary use of a portable service terminal that can
4 be connected to the ASC via zone temperature or directly at the controller. The
5 capabilities of the portable service terminal shall include, but not be limited to, the
6 following information for the:
- 7 1. Display temperatures
 - 8 2. Display status
 - 9 3. Display setpoints
 - 10 4. Display control parameters
 - 11 5. Override binary output control
 - 12 6. Override analog output control
 - 13 7. Override analog setpoints
 - 14 8. Modification of gain and offset constants
- 15
- 16 H. All system setpoints, proportional bands, control algorithms, and any other
17 programmable parameters shall be stored such that a power failure of any duration
18 does not necessitate reprogramming the ASC.
- 19
- 20 I. Terminal unit space sensors shall be provided with digital displays with setpoint
21 adjustments and manual occupancy override and indication of occupancy status.
22 Provide information to the AE on sensor colors offered by the manufacturer and
23 obtain approval on what color should be provided on the project. Provide setpoint
24 adjustment as specified in the DDC Input/Output Summary Table and sequence of
25 operation
- 26
- 27 J. All system setpoints, proportional bands, control algorithms, calibration constants, and
28 any other programmable parameters shall be stored such that a power failure of any
29 duration does not necessitate reprogramming the ASC.
- 30
- 31 K. All application specific controllers shall be fully programmable. Question and answer
32 or template programming is not acceptable unless this is used to generate the initial
33 application program and the result is able to be freely modified without restriction.
34 Control sequences for terminal unit control that utilize devices wired directly to the
35 terminal unit application controller shall be programmed in the application specific
36 controller and shall be stand-alone in function, i.e. occupancy sensing, temperature
37 setpoint setback, etc. Supervisory controllers shall not be involved in the control
38 sequence logic unless it involves sharing data between or from individual terminal
39 unit controllers to be utilized in a global sequence, i.e. trim and respond strategies,
40 terminal unit grouping, etc.

41 42 2.10 OPERATOR INTERFACE REQUIREMENTS

- 43
- 44 A. Command Entry/Menu Selection Process
- 45 1. Operator interface software shall minimize operator training through the use of
46 English language prompting and English language point identification.
- 47
- 48 B. Text-Based Displays

1 1. The operator interface shall provide consistent text-based displays of all system
2 point and application data described in this specification. Point identification,
3 engineering units, status indication, and application naming conventions shall be
4 the same at all operator devices.
5

6 C. Graphic-Based Displays

7 1. The operator interface shall provide graphic based displays of each system. The
8 point data associated with each system shall dynamically update at a minimum of
9 every 30 seconds. Graphic displays shall be linked to each other to provide a
10 “drill down” capability from main graphic displays to more specific system based
11 displays. Provide a building level graphic display that links to system graphics.
12 For systems that have ASC controlled terminal unit controls, provide a building
13 floor plan with dynamic temperatures shown on the graphic that can be drilled
14 into for more specific terminal information. Points provided in the graphic shall
15 have the override and adjust capability specified under operator commands. The
16 contractor providing the DDC system under this Section shall provide all graphic
17 displays for the project. Submit all graphic displays to the Owner control
18 personnel for review and approval. Graphics shall be completed to provide
19 enough time for approval and time for binding to be in place before control
20 system commissioning is scheduled to occur.
21

22 D. Password Protection

23 1. Multiple-level password access protection shall be provided to allow the
24 user/manager to limit control, display, and data base manipulation capabilities as
25 he deems appropriate for each user, based upon an assigned password.
26 2. Passwords shall be exactly the same for all operator devices.
27 3. A minimum of three levels of access shall be supported:
28 a. Level 1: Data access and display
29 b. Level 2 = Level 1 + operator overrides and commands
30 c. Level 3 = Level 2 + database generation and modification
31 4. A minimum of 4 passwords shall be supported at each supervisory controller.
32 5. Operators will be able to perform only those commands available for their
33 respective passwords. Menu selections displayed at any operator device shall be
34 limited to only those items defined for the access level of the password used to
35 log-on.
36 6. Provide user definable, automatic log-off timers of from 1 to 60 minutes to
37 prevent operators from inadvertently leaving devices on-line.
38

39 2.11 OPERATOR COMMANDS:

40 A. The operator interface shall allow the operator to perform commands including, but
41 not limited to, the following:
42 1. Start-up or shutdown selected equipment
43 2. Adjust setpoints
44 3. Override analog and binary outputs
45 4. Add/modify/delete time programming
46 5. Enable/disable process execution
47 6. Lock/unlock alarm reporting for each point
48 7. Enable/disable totalization for each point
49

- 1 8. Enable/disable trending
- 2 9. Enter temporary override schedules
- 3 10. Define holiday schedules
- 4 11. Change time/date
- 5 12. Enter/modify analog alarm limits
- 6 13. Enable/disable analog alarm limits
- 7 14. Enable/disable demand limiting
- 8 15. Enable/disable duty cycle
- 9

10 2.12 LOGS AND SUMMARIES:

- 11
- 12 A. Reports shall be generated manually, and directed to the displays. As a minimum, the
- 13 system shall allow the user to easily obtain the following general listing of all points
- 14 in the system that shall include, but not be limited to:
- 15 1. Points currently in alarm
- 16 2. Off-line points
- 17 3. Points currently in override status
- 18 4. Points in weekly schedules
- 19 5. Holiday programming
- 20
- 21 B. Summaries shall be provided for specific points, for a logical point group, for a user-
- 22 selected group of groups, or for the entire facility without restriction due to the
- 23 hardware configuration on the facility management system. Under no conditions shall
- 24 the operator need to specify the address of hardware controller to obtain system
- 25 information.
- 26

27 2.13 SYSTEM CONFIGURATION AND DEFINITION:

- 28
- 29 A. All temperature and equipment control strategies and energy management routines
- 30 shall be definable by the operator. System definition and modification procedures
- 31 shall not interfere with normal system operation and control.
- 32
- 33 B. The system shall be provided complete with all equipment, software, and
- 34 documentation necessary to allow an operator to independently perform the following
- 35 functions:
- 36 1. Add/delete/modify application specific controllers
- 37 2. Add/delete/modify points of any type, and all associated point parameters, and
- 38 tuning constants
- 39 3. Add/delete/modify alarm reporting definition for each point
- 40 4. Add/delete/modify energy management applications
- 41 5. Add/delete/modify time and calendar-based programming
- 42 6. Add/delete/modify totalization for every point
- 43 7. Add/delete/modify historical data trending for every point
- 44 8. Add/delete/modify configured control processes
- 45 9. Add/delete/modify dial-up telecommunication definition
- 46 10. Add/delete/modify all operator passwords
- 47 11. Add/delete/modify alarm messages

1 appear together on the flat panel display or printed log. Assignment of points to a
2 group shall not be restricted by hardware configuration of the points of direct digital
3 control. It shall be possible to assign a point to appear in more than one system. An
4 English descriptor and an alpha/numeric identifier shall identify each system.
5

- 6 D. This Direct Digital Control system as herein specified shall be fully integrated and
7 completely installed by this section. It shall include all required computer CPU
8 software and hardware. Include the engineering, installation, supervision, calibration,
9 software programming, and checkout necessary for a fully operational system.

10
11 3.2 INSTALLATION
12

- 13 A. All work and materials are to conform in every detail to the rules and requirements of
14 the National Electrical Code and present manufacturing standards. All wiring and
15 cable installation shall conform with the wiring installation as specified in the
16 installation section of Section 23 09 14. All material shall be UL approved.
17
18 B. Install system and materials in accordance with manufacturer's instructions, rough-in
19 drawings and details on drawings.
20
21 C. Line voltage wiring to power the DDC Controllers, not provided by the Division 26
22 contractor, to be by this contractor.
23
24 D. Provide uninterruptable power supplies where necessary to provide proper startup of
25 equipment or to accomplish power restart control sequences specified.
26
27 E. Mount control panels adjacent to associated equipment on vibration-free walls or free-
28 standing angle iron supports. One cabinet may accommodate more than one system in
29 same equipment room. Provide engraved plastic nameplates for instruments and
30 controls inside cabinet and on cabinet face.
31
32 F. Provide as-built control drawings of all systems served by each local panel in a
33 location adjacent to or inside of panel cover. Provide a protective cover or envelope
34 for drawings.
35
36 G. Cable tray routing of the communication trunks is acceptable.
37
38 H. Provide all necessary routers and or repeaters to accomplish connection to the BAN
39 via the panel-mounted port provided.
40
41 I. Provide two data jacks in control panels housing supervisory controllers and allocate
42 6"x6" for each data jack in the panel. The first jack will be used for connecting the
43 supervisory controller to the BAN. The second jack will be used as a spare for
44 connecting to the BAN by service personnel.
45
46 J. Provide an input for a service shutdown toggle switch for each air handling unit
47 system provided inside the temperature control panel that will initiate a logical
48 shutdown of the air handling unit system.
49

- 1 K. All tubing, cable and individual wiring is to be permanently tagged, with numbers
2 corresponding with "Record Drawings", spares are to be labelled as "Spare".
3
4 L. Provide technician to work with air balancing contractor and/or provide balancing
5 contractor with necessary hardware to over-ride DDC controllers for air balancing.
6
7 M. Provide documentation to demonstrate that all points, input and output, have been
8 checked out and verified operational, note any points not operating properly with
9 notation of reason.

10

11 3.3 OWNER TRAINING

12

- 13 A. Contractor to provide factory authorized representative and/or field personnel
14 knowledgeable with the operations, maintenance and troubleshooting of the system
15 and/or components defined within this section for a minimum period of 8 hours.
16
17 B. Provide two follow-up visits for troubleshooting and instruction, one six months after
18 substantial completion and the other at the end of the warranty period. Length of each
19 visit to be not less than 2 hours or the time necessary to provide required information
20 and complete troubleshooting and inspection activity for all controls installed under
21 23 09 23, 23 09 14, and 23 09 93. Coordinate the visit with the Owner and provide an
22 inspection report to the Owner of any deficiencies found.

23

24

END OF SECTION

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1 SECTION 23 09 93
2 SEQUENCE OF OPERATION FOR HVAC CONTROLS
3

4 PART 1 GENERAL
5

6 1.1 SCOPE
7

8 A. This section includes control sequences for HVAC equipment as well as equipment
9 furnished by others that may need monitoring or control. Included are the following
10 topics:

- 11 1. Part 1 – General
 - 12 a. Scope
 - 13 b. Related Work
 - 14 c. Description of Work
 - 15 d. Submittals
 - 16 e. Operation and Maintenance Data
 - 17 f. Design Criteria
- 18 2. Part 2 – Products
 - 19 a. Non-Applicable
- 20 3. Part 3 – Execution
 - 21 a. F-1 / ACCU-1 / ERV-1
 - 22 b. F-2 / ACCU-2 (F-3 / ACCU-3 Similar)
 - 23 c. Transfer Fan (TF-1)
 - 24 d. Exhaust fans (EF-1, EF-2, EF-3)
 - 25 e. Electric Baseboard (Multiple)
 - 26 f. Electric Wall Heaters (Multiple)

27
28 1.2 RELATED WORK
29

- 30 A. Applicable provisions of Division 00 and 01 govern work under this Section.
- 31
- 32 B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination
- 33
- 34 C. Section 23 09 14 - Pneumatic and Electric Controls
- 35
- 36 D. Section 23 09 23 - Direct Digital Controls (DDC)
- 37
- 38 E. Division 23 - HVAC - Equipment provided to be controlled or monitored
- 39
- 40 F. Division 26 - Electrical - Equipment provided to be controlled or monitored
- 41
- 42 G. Division 28 - Electronic Safety and Security
- 43

44 1.3 REFERENCE
45

- 46 A. Section 23 09 14 work includes furnishing and installing all field devices, including
47 electronic sensors for the DDC of this section, equipment, and all related field wiring,
48 interlocking control wiring between equipment, pneumatic tubing, sensor mounting,
49 etc., that is covered in that section.

1 1.4 DESCRIPTION OF WORK
2

- 3 A. Control sequences are hereby defined as the manner and method by which automatic
4 controls function. Requirements for each type of operation are specified in this
5 section.
6
- 7 B. Operation equipment, devices and system components required for automatic control
8 systems are specified in other Division 23 control sections of these specifications.
9
- 10 C. All temperature, humidity, and pressure sensing, and all other control signal
11 transportation for the control sequences shall be furnished under Section 23 09 14.
12 All pneumatic, electronic, and electric input/output signals shall be extended under
13 Section 23 09 14, with adequate lead length for termination within the appropriate
14 control panel being provided under Section 23 09 23.
15
- 16 D. Sequences for equipment controlled by Direct Digital Controls (DDC) as specified are
17 accomplished by hardware and software provided under Section 23 09 23. Sequences
18 for equipment controlled by pneumatic or electric self-contained controls are
19 accomplished by hardware provided under Section 23 09 14.
20

21 1.5 SUBMITTALS
22

- 23 A. Refer to Division 1, General Conditions, Submittals, Section 23 05 00 and Sections 23
24 09 23, and 23 09 14 for descriptions of what should be included in the submittals.
25
- 26 B. Shop drawings shall be provided. Provide a complete narrative of the sequence of
27 operations for equipment that is controlled through the DDC system. The narrative of
28 the sequence of operation shall not be a verbatim copy of the sequences contained
29 herein, but shall reflect the actual operation as applied by the contractor.
30

31 1.6 OPERATION AND MAINTENANCE DATA
32

- 33 A. All operations and maintenance data shall comply with the submission and content
34 requirements specified under section GENERAL REQUIREMENTS.
35

36 1.7 DESIGN CRITERIA
37

- 38 A. Reference Section 23 09 14.
39
40

1 PART 2 – PRODUCTS

2
3 2.1 Not applicable to this Section – reference Sections 23 09 14 and 23 09 23 for product
4 descriptions.

5
6 PART 3 – EXECUTION

7
8 3.1 CONTROL SEQUENCES

9
10 A. F-1 / ACCU-1 / ERV-1

- 11 1. This system is controlled by the DDC BAS system.
- 12 2. Provide all control wiring and devices.
- 13 3. This system includes:
- 14 a. Natural gas furnace with:
- 15 1) Modulating heat.
- 16 2) Variable speed blower with ECM motor.
- 17 b. Three zone control dampers with zone level thermostats.
- 18 c. Air cooled compressor condensing unit with 2-stages of cooling.
- 19 d. Energy Recovery Unit (ERV-1) with supply and return fan ECM motors.
- 20 1) Motorized exhaust air damper (exhaust from ERV to louver).
- 21 2) Motorized outside air intake damper (outside air to ERV).
- 22 e. ERV-1 “Standard” and “Assembly” ventilation momentary switch with pilot
- 23 light.
- 24 1) Switch to be labeled “Standard Ventilation & Assembly Ventilation”
- 25 4. When the building is occupied (“Standard” Ventilation):
- 26 a. F-1 shall energize.
- 27 1) ERV-1 is active at “standard ventilation”.
- 28 2) ERV-1 motorized dampers open.
- 29 3) ERV-1 supply air and exhaust air fans energize.
- 30 b. F-1 gas heat or ACCU-1 cooling shall modulate / stage energized as
- 31 required to maintain space temperatures.
- 32 c. Zone control dampers shall modulate to maintain space temperature in zone
- 33 1) On a call for space cooling, the control damper shall modulate to its
- 34 100% open position.
- 35 2) On a call for space heating, the control damper shall modulate to its
- 36 minimum position.
- 37 5. When the manual switch is turned to “Assembly” ventilation while in the
- 38 occupied mode:
- 39 a. F-1 and ERV-1 remain active, similar to “Standard” ventilation.
- 40 b. ERV-1 fans increase speed to allow for higher ventilation rate.
- 41 c. ERV-1 shall run on higher ventilation rate until:
- 42 1) “Standard” ventilation is manually activated.
- 43 2) Unit moves to the unoccupied mode.
- 44 3) The internal BAS timer (2 hrs – adjustable) has expired.
- 45 6. When the Building is unoccupied:
- 46 a. On a call for setback heating or cooling, F-1 shall energize.
- 47 b. F-1 heat or ACCU-1 cooling shall energize and modulate / stage as required
- 48 to maintain setback temperatures.
- 49 c. ERV-1 shall remain off and motorized dampers closed.

- 1 d. Once setback temperature is achieved, the unit shall cycle off.
2
3 B. F-2 / ACCU-2 (F-3 / ACCU-3 Similar)
4 1. This system is controlled by the DDC BAS system.
5 2. Provide all control wiring and devices.
6 a. Natural gas furnace with:
7 1) Modulating heat.
8 2) Variable speed blower with ECM motor.
9 b. Three zone control dampers with zone level thermostats.
10 c. Air cooled compressor condensing unit with 2-stages of cooling.
11 d. Motorized outside air intake damper.
12 3. When the building is occupied:
13 a. Motorized outside air damper shall open.
14 b. F-2 shall energize.
15 c. F-2 gas heat or ACCU-2 cooling shall energized as required to maintain
16 space temperatures.
17 d. Zone control dampers shall modulate to maintain space temperature in zone
18 1) On a call for space cooling, the control damper shall modulate to its
19 100% open position.
20 2) On a call for space heating, the control damper shall modulate to its
21 minimum position.
22 4. When the Building is unoccupied:
23 a. Motorized outside air damper shall be closed.
24 b. On a call for setback heating or cooling, F-2 shall energize.
25 c. F-2 heat or ACCU-2 cooling shall energize and modulate / stage as required
26 to maintain setback temperatures.
27 d. Once setback temperature is achieved, the unit shall cycle off.
28

29 3.2 TRANSFER FAN (TF-1)
30

- 31 A. This system will not be integrated into the BAS. Unit provided stand-alone controls
32 shall be used.
33
34 B. System includes:
35 1. Ceiling mounted fan.
36 2. Line voltage, reverse acting thermostat.
37
38 C. On a call for space cooling, the fan shall energize.
39
40 D. On a drop in space temperature below setpoint, the fan shall turn off.
41
42 E. Provide temperature sensor for monitoring purposes only.
43

44 3.3 EXHAUST FANS (EF-1, EF-2, EF-3)
45

- 46 A. Fan control will not be integrated into the BAS.
47
48 B. Fans shall be energized with space lighting.

- 1 3.4 ELECTRIC BASEBOARD HEATERS (MULTIPLE)
2
3 A. These units are controlled by the DDC system and integrated into the zone control
4 damper sequence.
5
6 B. This system includes:
7 1. Electric Baseboard (see plan for quantities)
8
9 C. Electric baseboard shall only be energized when the associated zone is in the heating
10 mode, zone damper is 100% open and the space is below setpoint.
11
12 D. Once the space reaches setpoint, the electric baseboard shall be off.
13
14 E. Electric baseboards shall be locked out at all times when:
15 1. At time the outside air temperature is 50F or above (adj.).
16 2. When the building is in the unoccupied mode.
17

- 18 3.5 ELECTRIC WALL HEATERS (MULTIPLE)
19
20 A. These units is not controlled by the DDC system or integrated into the DDC system.
21 These units are controlled by “stand-alone controls”.
22
23 B. On a call for heating, the heater shall be energized to maintain setpoint (50F
24 adjustable). The heater shall turn-off once setpoint has been reach.
25

26
END OF SECTION

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SECTION 23 11 00

FACILITY FUEL PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section contains specifications for fuel pipe and fuel pipe fittings for this project. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Shop Drawings
 - e. Quality Assurance
 - f. Delivery, Storage, and Handling
 - g. Design Criteria
 - h. Natural Gas Service
2. Part 2 – Products
 - a. Natural Gas Piping
 - b. Natural Gas System Valves
 - c. Vents and Relief Valves
 - d. Unions and Flanges
3. Part 3 – Execution
 - a. Preparation
 - b. Erection
 - c. Welded Pipe Joints
 - d. Threaded Pipe Joints
 - e. Natural Gas
 - f. Shut Off Valves
 - g. Gas Pressure Regulators
 - h. Vents and Relief Valves
 - i. Unions and Flanges
 - j. Gaskets
 - k. Piping System Leak Tests
 - l. Piping System Leakage Test Report

1.3 RELATED WORK

- A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

1.4 REFERENCE STANDARDS

- A. ANSI B16.3 Malleable Iron Threaded Fittings

1 B. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

2
3 C. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and
4 Elevated Temperatures

5
6 1.5 SHOP DRAWINGS

7
8 A. Refer to division 1, General Conditions, Submittals.

9
10 B. Contractor shall submit schedule indicating the ASTM specification number of the
11 pipe being proposed along with its type and grade and sufficient information to
12 indicate the type and rating of fittings for each service.

13
14 C. Type E Or S Steel Pipe:

- 15 1. Mill certification papers, also known as material test reports, for the pipe
16 furnished for this project, in English. Heat numbers on these papers to match the
17 heat numbers stenciled on the pipe. Chemical analysis indicated on the mill
18 certification papers to meet or exceed the requirements of the referenced ASTM
19 specification.

20
21 1.6 QUALITY ASSURANCE

22
23 A. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or
24 stenciled to each length or each bundle, depending on the size of the pipe, and in
25 accordance with the appropriate ASTM specification.

26
27 B. Any installed material not meeting the specification requirements must be replaced
28 with material that meets these specifications without additional cost to the Owner.

29
30 1.7 DELIVERY, STORAGE, AND HANDLING

31
32 A. Promptly inspect shipments to insure that the material is undamaged and complies
33 with specifications.

34
35 B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to
36 avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and
37 fitting ends so they are not damaged. Where end caps are provided or specified, take
38 precautions so the caps remain in place.

39
40 C. Offsite storage agreements will not relieve the contractor from using proper storage
41 techniques.

42
43 D. Storage and protection methods must allow inspection to verify products.

44
45 1.8 DESIGN CRITERIA

46
47 A. Use only new material, free of defects, rust and scale, and meeting the latest revision
48 of ASTM specifications as listed in this specification.

- 1 B. Construct all piping for the highest pressures and temperatures in the respective
2 system in accordance with ANSI B31, but not less than 125 psig unless specifically
3 indicated otherwise.
4
5 C. Non-metallic piping will be acceptable only for the services indicated. It will not be
6 acceptable in occupied spaces and ventilation plenum spaces, including plenum
7 ceilings.
8
9 D. Where weld fittings or mechanical grooved fittings are used, use only long radius
10 elbows having a centerline radius of 1.5 pipe diameters.
11
12 E. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be
13 substituted at Contractor's option. Where the grade or type is not specified, Contractor
14 may choose from those commercially available.
15

16 1.9 NATURAL GAS SERVICE
17

- 18 A. All charges for the gas service and modification of the natural gas services as shown
19 on the plans, including any connections from the main in the street, relocation of gas
20 meter, new gas meter and associated site work shall be paid by this Contractor,
21 including setting of gas meter(s) and all work performed by the gas company.
22
23

24 PART 2 PRODUCTS
25

26 2.1 NATURAL GAS
27

- 28 A. 2" and Smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel
29 pipe with ASTM A197/ANSI B16.3 class 150 black malleable iron threaded fittings
30 or ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld
31 fittings.
32

33 2.2 NATURAL GAS SYSTEM VALVES
34

- 35 A. Shut Off Valves
36 1. 2" and smaller: Ball valve, bronze body, threaded ends, chrome-plated bronze or
37 stainless steel ball, full or conventional port, teflon seat, blowout-proof stem,
38 two-piece construction, suitable for 150 psig working pressure, U.L. listed for
39 use as natural gas shut-off.
40 2. 2-1/2" through 4": Cast iron body, flanged ends, bronze bearings, electroless
41 nickel plated cast iron plug with Hycar resilient plug seal, Buna-N stem seal
42 packing, lever actuator, 175 psi W.O.G., U.L. listed for use as natural gas shut-
43 off.
44 3. 5" and larger: Cast iron body, flanged ends, stainless steel bearings, resilient
45 faced plugs, totally enclosed hand wheel actuators, 175 psi W.O.G., U.L. listed
46 for use as natural gas shut-off.
47 4. DeZurik, Homestead, Rockwell, Walworth.
48

1 B. Gas Pressure Regulators

- 2 1. 2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile
3 diaphragm, threaded ends, 150 psi W.O.G., -20°F to 150°F.

4
5 2.3 VENTS AND RELIEF VALVES

- 6
7 A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent
8 is connected.

9
10 2.4 UNIONS AND FLANGES

- 11
12 A. 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats.
13 Use black malleable iron on black steel piping and galvanized malleable iron on
14 galvanized steel piping. Use unions of a pressure class equal to or higher than that
15 specified for the fittings of the respective piping service but not less than 250 psi.

16
17
18 PART 3 EXECUTION

19
20 3.1 PREPARATION

- 21
22 A. Remove all foreign material from interior and exterior of pipe and fittings.

23
24 3.2 ERECTION

- 25
26 A. Install all piping parallel to building walls and ceilings and at heights which do not
27 obstruct any portion of a window, doorway, stairway, or passageway. Where
28 interferences develop in the field, offset or reroute piping as required to clear such
29 interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling
30 heights, door and window openings, or other architectural details before installing
31 piping.
32
33 B. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping
34 may expand and contract without damage to itself, equipment, or building.
35
36 C. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded
37 piping, bushings are not acceptable.
38
39 D. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2)
40 the diameter of the main.
41
42 E. Do not route piping through transformer vaults or above transformers, panelboards, or
43 switchboards, including the required service space for this equipment, unless the
44 piping is serving this equipment.
45
46 F. Install all valves, and piping specialties, including items furnished by others, as
47 specified and/or detailed. Make connections to all equipment installed by others
48 where that equipment requires the piping services indicated in this section.

- 1 3.3 THREADED PIPE JOINTS
2
3 A. Use a Teflon based thread lubricant or Teflon tape when making joints; no hard
4 setting pipe thread cement or caulking will be allowed.
5
- 6 3.4 NATURAL GAS
7
8 A. Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4"
9 minimum depth dirt leg at the bottom of each vertical run and at each appliance.
10 When installing mains and branches, cap gas tight each tee or pipe end which will not
11 be immediately extended. All branch connections to the main shall be from the top or
12 side of the main.
13
14 B. Do not install gas pipe in a ventilation air plenum.
15
16 C. If an above ground vent terminates in an area subject to snow accumulation, terminate
17 the line at least five feet above grade.
18
19 D. Install a shut off valve, regulator and dirt leg at each appliance. Provide a valved
20 connection at the main for equipment and appliances furnished by others.
21
22 E. Piping through a roof shall be run through an approved roof penetration with flashing
23 and counter flashing.
24
25 F. Each gas pressure reducing valve vent and relief valve vent shall be run separately to a
26 point outside of the building, terminated with a screened vent cap, and located
27 according to gas utility regulations.
28
- 29 3.5 SHUT-OFF VALVES
30
31 A. Install shut-off valves at all equipment, at each branch take-off from mains, and at
32 each automatic valve for isolation or repair.
33
- 34 3.6 GAS PRESSURE REGULATORS
35
36 A. When the gas pressure regulator is equipped with a vent connection, run a connection
37 size vent to outside air in accordance with codes. Use a larger size vent when required
38 by the manufacturer's installation instructions.
39
- 40 3.7 VENTS AND RELIEF VALVES
41
42 A. Install vent and relief valve discharge lines as indicated on the drawings, as detailed,
43 and as specified for each specific valve or piping specialty item. In no event is a
44 termination to occur less than six feet above a roof line.
45
- 46 3.8 UNIONS AND FLANGES
47

- 1 A. Install a union or flange, as required, at each automatic control valve and at each
2 piping specialty or piece of equipment which may require removal for maintenance,
3 repair, or replacement. Where a valve is located at a piece of equipment, locate the
4 flange or union connection on the equipment side of the valve. Concealed unions or
5 flanges are not acceptable.
6

7 3.9 GASKETS
8

- 9 A. Store horizontally in cool, dry location and protect from sunlight, water and
10 chemicals. Inspect flange surfaces for warping, radial scoring or heavy tool marks.
11 Inspect fasteners, nuts and washers for burrs or cracks. Replace defective materials.
12 B. Align flanges parallel and perpendicular with bolt holes centered without using
13 excessive force. Center gasket in opening. Lubricate fastener threads, nuts and
14 washers with lubricant formulated for application.
15
16 C. Draw flanges together evenly to avoid pinching gasket. Tighten fasteners in cross
17 pattern sequence (12 – 6 o'clock, 3 – 9 o'clock, etc.), one pass by hand and four
18 passes by torque wrench at 30% full torque, 60% full torque and two passes at full
19 torque per ASME B16.5.
20

21 3.10 PIPING SYSTEM LEAK TESTS
22

- 23 A. Verify that the piping system being tested is fully connected to all components and
24 that all equipment is properly installed, wired, and ready for operation. If required for
25 the additional pressure load under test, provide temporary restraints at expansion
26 joints or isolate them during the test. Verify that hangers can withstand any additional
27 weight load that may be imposed by the test.
28
29 B. Provide all piping, fittings, blind flanges, and equipment to perform the testing.
30
31 C. Conduct pressure test with test medium of air or water unless specifically indicated.
32 Minimum test time is indicated in the table below; additional time may be necessary
33 to conduct an examination for leakage. Each test must be witnessed by the Division's
34 representative. If leaks are found, repair the area with new materials and repeat the
35 test; caulking will not be acceptable.
36
37 D. Gradually increase the pressure to not more than one half of the test pressure; then
38 increase the pressure in steps of approximately one-tenth of the test pressure until the
39 required test pressure is reached. Examine all joints and connections with a soap
40 bubble solution or equivalent method. The piping system exclusive of possible
41 localized instances at pump or valve packing shall show no evidence of leaking. After
42 testing is complete, slowly release the pressure in a safe manner.
43
44 E. Measure natural gas system test pressure with a water manometer or an equivalent
45 device calibrated in increments not greater than 0.1 inch water column. System will
46 not be approved until it can be demonstrated that there is no measurable loss of test
47 pressure during the test period.

<u>System</u>	<u>Pressure</u>	<u>Medium</u>	<u>Duration</u>
Natural gas	100 psig	Air	24 hr

- 1 F. All pressure tests are to be documented on the form included in this specification.
2
3 G. On piping that cannot be tested because of connection to an active line, provide
4 temporary blind flanges and hydrostatically test new section of piping. After
5 completion of test, remove temporary flanges and make final connections to piping.
6 Die penetrate test pass weld or x-ray the piping that was not hydrostatically tested up
7 to the active system.
8

9 END OF SECTION

PIPING SYSTEM LEAKAGE TEST REPORT

Date Submitted: _____

Project Name: _____

Location: _____

Contractor: _____

- HVAC Refrigeration Controls
 Power Plant Plumbing Sprinkler
Test Medium: Air Water Other _____

Test performed per specification section No. _____

Specified Test Duration _____ **Hours** **Specified Test Pressure** _____ **PSIG**

System Identification: _____

Describe Location: _____

Test Date: _____	
Start Test Time: _____	Initial Pressure: _____ PSIG
Stop Test Time: _____	Final Pressure: _____ PSIG

Tested By: _____

Witnessed By: _____

Title: _____

Title: _____

Signed: _____

Signed: _____

Date: _____

Date: _____

Comments: _____

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for all duct systems used on this project. Included are the following topics:
1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Shop Drawings
 - f. Design Criteria
 2. Part 2 – Products
 - a. General
 - b. Ductwork Pressure Class
 - c. Materials
 - d. Low Pressure Ductwork (Maximum 2 inch pressure class)
 - e. Duct Sealant
 - f. Gaskets
 3. Part 3 – Execution
 - a. Installation
 - b. Low Pressure Duct (Maximum 2 inch pressure class)
 - c. Cleaning
 - d. Leakage Test
 4. Appendix
 - a. Duct Leakage Test Report

1.3 RELATED WORK

- A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- B. Section 23 33 00 – Air Duct Accessories

1.4 REFERENCE STANDARDS

- A. ASTM International
1. ASTM A90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
 2. ASTM A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

- 1 3. ASTM A623 Standard Specification for Steel Sheet, Zinc-Coated
2 (Galvanized) by the Hot-Dip Process
- 3 4. ASTM A527 Specification for General Requirements for Steel Sheet, Zinc-
4 Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
- 5 5. ASTM 924 Standard Specification for General Requirements for Sheet Steel,
6 Metallic-coated by the Hot-dip Method
- 7 6. ASTM C 1071 Specification for Fibrous Glass Duct Lining Insulation
- 8 7. ASTM C 411 Test Method for Hot Surface Performance of High Temperature
9 Thermal Insulation
- 10 8. ASTM E 84 Test Method for Surface Burning Characteristics of Building
11 Materials
- 12 9. ASTM C 1338 Test Method for Determining Fungal Resistance of Insulation
13 Materials and Facings
- 14 10. ASTM G 21 Standard Practice for Determining Resistance of Synthetic
15 Polymeric Materials to Fungi
- 16 11. ASTM C 916 Standard Specification for Adhesives for Duct Thermal
17 Insulation NFPA 90A. Standard for the Installation of Air Conditioning and
18 Ventilating Systems
- 19 12. UL 181 Standard for Safety for Factory Made Air Ducts and Air
20 Connectors.
- 21 13. NAIMA Fibrous Glass Duct Liner Standard

23 1.5 QUALITY ASSURANCE

- 24 A. Refer to Division 1, General Conditions, Equals and Substitutions.

27 1.6 SHOP DRAWINGS

- 28 A. Refer to Division 1, General Conditions, Submittals.
- 29 1. Include manufacturer's data and/or Contractor data for the following:
30 a. Fabrication and installation drawings.
31 b. Schedule of duct systems including material of construction, gauge, pressure
32 class, system class, method of reinforcement, joint construction, fitting
33 construction, and support methods, all with details as appropriate.
34 c. Duct sealant and gasket material.
35 d. Duct liner including data on thermal conductivity, air friction correction
36 factor, and limitation on temperature and velocity.
37

39 1.7 DESIGN CRITERIA

- 40 A. Construct all ductwork to be free from vibration, chatter, objectionable pulsations and
41 leakage under specified operating conditions.
- 42 B. Use material, weight, thickness, gauge, construction and installation methods as
43 outlined in the following SMACNA publications, unless noted otherwise:
- 44 1. HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
 - 45 2. HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
 - 46 3. HVAC Systems - Duct Design, 4th Edition, 2006
 - 47
 - 48

1 C. Use products which conform to NFPA 90A, possessing a flame spread rating of not
2 over 25 and a smoke developed rating no higher than 50.
3

4 1.8 DELIVERY, STORAGE AND HANDLING
5

6 A. Promptly inspect shipments to ensure that Ductwork is undamaged and complies with
7 the specification.
8

9 B. Protect Ductwork against damage.
10

11 C. Protect Ductwork by storing inside or by durable, waterproof, above ground
12 packaging. Do not store material on grade. Protect Ductwork from dirt, dust,
13 construction debris and foreign material. Where end caps/packaging are provided,
14 take precautions so caps/packaging remain in place and free from damage.
15

16 D. Offsite storage agreements do not relieve the contractor from using proper storage
17 techniques.
18

19 E. Storage and protection methods must allow inspection to verify products.
20
21

22 PART 2 PRODUCTS
23

24 2.1 GENERAL
25

26 A. All sheet metal used for construction of duct shall be 24 gauge or heavier except for
27 round and spiral ductwork and spiral duct take-offs 12" and below may be 26 gauge
28 where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible,
29 3rd Edition, 2005.
30

31 B. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified,
32 dimensions are net, inside of liner.
33

34 2.2 DUCTWORK PRESSURE CLASS
35

36 A. Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is
37 2 inch W.G. positive or negative, depending on the application. Transfer ductwork
38 minimum acceptable duct pressure class is 1 inch W.G. positive or negative,
39 depending on the application. Duct system pressure classes not indicated on the
40 drawings to be as follows:
41

42	1. Supply Duct	2.0 in. pressure class
43	2. Transfer air ducts	1.0 in. pressure class
44	3. Exhaust air ducts	2.0 in. pressure class
45	4. Return air ducts	2.0 in. pressure class
46	5. Relief air ducts	2.0 in. pressure class
47	6. Outside air ducts	2.0 in. pressure class
48	7. Mixed air ducts	2.0 in. pressure class
49		

1 2.3 MATERIALS
2

3 A. Galvanized Steel Sheet

- 4 1. Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized
5 coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance
6 with ASTM A90. Provide "Paint Grip" finish or galvanneal sheetmetal for
7 ductwork that will be painted.
8

9 2.4 LOW PRESSURE DUCTWORK (Maximum 2 inch pressure class)
10

11 A. Fabricate and install ductwork in sizes indicated on the drawings and in accordance
12 with SMACNA recommendations, except as modified below.
13

14 B. Construct so that all interior surfaces are smooth. Use slip and drive or flanged and
15 bolted construction when fabricating rectangular ductwork. Use spiral lock seam
16 construction when fabricating round spiral ductwork. Sheet metal screws may be used
17 on duct hangers, transverse joints and other SMACNA approved locations if the screw
18 does not extend more than 1/2 inch into the duct.
19

20 C. Use elbows and tees with a center line radius to width or diameter ratio of 1.5
21 wherever space permits. When a shorter radius must be used due to limited space,
22 install single wall sheet metal splitter vanes in accordance with SMACNA
23 publications, Type RE 3. Where space will not allow and the C value of the radius
24 elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with
25 turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows will
26 not be acceptable. Straight taps or bullhead tees are not acceptable.
27

28 D. Where rectangular elbows are used, provide turning vanes in accordance with Section
29 23 33 00.
30

31 E. Provide expanded take-offs or 45 degree entry fittings for branch duct connections
32 with branch ductwork airflow velocities greater than 700 fpm. Square edge 90-degree
33 take-off fittings or straight taps will not be accepted.
34

35 F. Round ducts may be substituted for rectangular ducts if sized in accordance with
36 ASHRAE table of equivalent rectangular and round ducts. No variation of duct
37 configuration or sizes permitted except by written permission of the
38 Architect/Engineer.
39

40 G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible.
41 Divergence upstream of equipment shall not exceed 30 degrees; convergence
42 downstream shall not exceed 45 degrees.
43

44 2.5 DUCT SEALANT
45

46 A. Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peel & Seal,
47 Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal, or approved equal.
48 Silicone sealants are not allowed in any type of ductwork installation.

- 1 B. Install sealants in strict accordance with manufacturer's recommendations, paying
2 special attention to temperature limitations. Allow sealant to fully cure before
3 pressure testing of ductwork, or before startup of air handling systems.
4

5 2.6 GASKETS

- 6
7 A. 2 inch pressure class and lower
8 1. Soft neoprene or butyl gaskets in combination with duct sealant for flanged
9 joints.
10

11
12 PART 3 EXECUTION

13
14 3.1 INSTALLATION

- 15
16 A. Verify dimensions at the site, making field measurements and drawings necessary for
17 fabrication and erection. Check plans showing work of other trades and consult with
18 Architect in the event of any interference.
19
20 B. Make allowances for beams, pipes or other obstructions in building construction and
21 for work of other contractors. Transform, divide or offset ducts as required, in
22 accordance with SMACNA HVAC Duct Construction Standards, Figure 4-7, except
23 do not reduce duct to less than six inches in any dimension and do not exceed an 8:1
24 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts,
25 construct easement as indicated in SMACNA HVAC Duct Construction Standards,
26 Figure 4-8, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar
27 obstructions may not pass through high pressure or fume exhaust ductwork.
28
29 C. Test openings for test and balance work will be provided under Section 23 05 93.
30
31 D. Provide frames constructed of angles or channels for coils, filters, dampers or other
32 devices installed in duct systems, and make all connections to such equipment
33 including equipment furnished by others. Secure frames with gaskets and screws or
34 nut, bolts and washers.
35
36 E. Install duct to pitch toward outside air intakes and drain to outside of building. Solder
37 or seal seams to form watertight joints.
38
39 F. Install all motor operated dampers and connect to or install all equipment furnished by
40 others. Blank off all unused portions of louvers, as indicated on the drawings, with 1-
41 1/2 inch board insulation with galvanized sheet metal backing on both sides.
42
43 G. Do not install ductwork through dedicated electrical rooms or spaces unless the
44 ductwork is serving this room or space.
45
46 H. Locate ducts with sufficient space around equipment to allow normal operating and
47 maintenance activities.
48
49 I. Provide adequate access to ductwork for cleaning purposes.

- 1 J. Provide temporary capping of ductwork openings to prevent entry of dirt, dust and
2 foreign material.
3
4 K. Protect diffusers, registers and grilles with plastic wrap or some other approved form
5 of protection to maintain dirt and dust free and to prevent entry of dirt, dust and
6 foreign material into the Ductwork.
7
8 L. During construction provide temporary closures of metal or taped polyethylene on
9 open ductwork to prevent construction dust from entering ductwork system.
10

11 3.2 DUCTWORK SUPPORT

12

- 13 A. Support ductwork in accordance with SMACNA HVAC Duct Construction
14 Standards, Figure 5-5, except supporting ductwork with secure wire method is not
15 allowed.
16
17 B. Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching serrated
18 spring loaded wedge mechanism fasteners rated for actual load. Steel cable hanging
19 systems will be allowed on round ductwork under 12 inches diameter if installed
20 utilizing two fasteners with two cable loops. Comply with the manufacturer's
21 installation instructions.
22

23 3.3 LOW PRESSURE DUCT (Maximum 2 inch pressure class)

24

- 25 A. Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal
26 class "A"; all seams, joints, and penetrations shall be sealed.
27
28 B. Install a manual balancing damper in each branch duct and for each diffuser or grille.
29 The use of splitter dampers, extractors, or grille face dampers will not be accepted for
30 balancing dampers.
31
32 C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct
33 with sheetmetal screws or pop rivets. Trapeze hangers may be used at contractor's
34 option.
35

36 3.4 CLEANING

37

- 38 A. Remove all dirt and foreign matter from the entire duct system and clean diffusers,
39 registers, grilles and the inside of air-handling units before operating fans.
40
41 B. Clean duct systems with high power vacuum machines where systems have been used
42 for temporary heat, air-conditioning, or ventilation purposes during construction.
43 Protect equipment that may be harmed by excessive dirt with filters, or bypass during
44 cleaning.
45

46 3.5 LEAKAGE TEST

47

- 48 A. Leakage test will not be required unless, during the balancing process, discrepancies
49 are found.

1
2

END OF SECTION

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SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes accessories used in the installation of duct systems. Included are the following topics:

1. Part 1 – General
 - a. Related Work
 - b. Reference Standards
 - c. Quality Assurance
 - d. Shop Drawings
 - e. Operation and Maintenance Data
2. Part 2 – Products
 - a. Manual Volume Dampers
 - b. Turning Vanes
 - c. Control Dampers
 - d. Smoke Detectors
 - e. Access Doors
 - f. Flexible Duct
 - g. Duct Lining
 - h. Flashings
 - i. Duct Flexible Connections
 - j. Hoods for Intake and Exhaust
 - k. Louvers
3. Part 3 – Execution
 - a. Manual Volume Dampers
 - b. Turning Vanes
 - c. Control Dampers
 - d. Smoke Detectors
 - e. Access Doors
 - f. Flashings
 - g. Duct Flexible Connections
 - h. Hoods for Intake and Exhaust
 - i. Louvers

1.3 RELATED WORK

- A. Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment
- B. Section 23 31 00 – HVAC Ducts and Casings

1 1.4 REFERENCE STANDARDS

- 2
3 A. NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
4
5 B. SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition,
6 1995
7
8 C. UL 214
9
10 D. UL 555 (6th edition) Standard for Fire Dampers and Ceiling Dampers
11

12 1.5 QUALITY ASSURANCE

- 13
14 A. Refer to Division 1, General Conditions, Equals and Substitutions
15

16 1.6 SHOP DRAWINGS

- 17
18 A. Refer to Division 1, General Conditions, Submittals.
19
20 B. Submit for all accessories and include dimensions, capacities, ratings, installation
21 instructions, and appropriate identification.
22
23 C. Submit manufacturer's color charts where finish color is specified to be selected by
24 the Architect/Engineer.
25

26 1.7 OPERATION AND MAINTENANCE DATA

- 27
28 A. All operations and maintenance data shall comply with the submission and content
29 requirements specified under section GENERAL REQUIREMENTS.
30
31

32 PART 2 PRODUCTS

33
34 2.1 MANUAL VOLUME DAMPERS

- 35
36 A. Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.
37
38 B. Dampers must be constructed in accordance with SMACNA Fig. 2-12, Fig. 2-13, and
39 notes relating to these figures, except as modified below.
40
41 C. Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in
42 multiple sections with mullions where width is over 48 inches. Use rivets or tack
43 welds to secure individual components; sheet metal screws will not be accepted.
44 Provide operators with locking devices and damper position indicators for each
45 damper; use an elevated platform on insulated ducts. Provide end bearings or
46 bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c.
47 pressure class or above.
48
49

1 2.2 TURNING VANES
2

- 3 A. Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved
4 equal.
5
6 B. Construct turning vanes and runners for square elbows in accordance with SMACNA
7 Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for
8 short radius elbows and elbows where one dimension changes in the turn in
9 accordance with SMACNA Fig. 2-5 and Fig. 2-6.

10
11 2.3 CONTROL DAMPERS
12

- 13 A. Provide control dampers shown on the plans and as required to perform the specified
14 functions. Dampers shall be rated for velocities that will be encountered at maximum
15 system design and rated for pressure equal or greater than the ductwork pressure class
16 as specified in Section 23 31 00 of the ductwork where the damper is installed.
17
18 B. Use only factory fabricated dampers with mechanically captured replaceable resilient
19 blade seals, stainless steel jamb seals and with entire assembly suitable for the
20 maximum temperature and air velocities encountered in the system.
21
22 C. Dampers in galvanized ductwork shall be constructed of galvanized steel and/or
23 aluminum.
24
25 D. All dampers, unless otherwise specified, to be rated at a minimum of 180° F working
26 temperature. Leakage testing shall be certified to be based on latest edition of AMCA
27 Standard 500-D and all dampers, unless otherwise specified, shall have leakage
28 ratings as follows:
29
30 1. Damper Class Differential Pressure Leakage
31 Class I 4" w.g. ≤8 CFM/ft²
32
33 E. Leakage rate dampers for differential pressures that they will encounter at maximum
34 system design pressures.
35
36 F. Steel framed dampers: Nailor models 2010 & 2020; Greenheck models VCD-33 &
37 VCD-42; Johnson Controls model V-1330; Ruskin Models CD60 & CD40; other
38 approved equal.
39
40 G. Dampers used for directed mixing of airstreams, i.e. outside air and return air, to be
41 parallel blade type and sized for an air velocity of 1800 to 2000 fpm with the damper
42 blades shall be arranged so that the air streams are directed at one another to facilitate
43 mixing. Dampers used for throttling or modulating applications other than air stream
44 mixing to be opposed blade type. Two position dampers may be parallel or opposed
45 blade type.
46
47 H. Dampers to have frames of not less than 16 gauge galvanized steel or 12 gauge
48 extruded aluminum. Blades to be two-ply steel airfoil of not less than 2 x 20 gauge
49 galvanized steel (14 gauge equivalent) or extruded aluminum airfoil, with stainless

1 steel, acetal, Celcon, bronze, or nylon bearings. Maximum allowable blade width is 8
2 inches. Use plated steel linkage hardware.

- 3
- 4 I. Maximum damper width is 48 inches; where required width exceeds 48 inches, use
5 multiple damper sections. Inside frame free area shall be a minimum of 90% of total
6 inside duct area.
- 7
- 8 J. Jack shafts shall be extended outside of the ductwork for external actuator mounting.
9 Provide bearings on the point of exit for support of damper shafts to prevent wear on
10 the shaft and the ductwork. If locating actuators out of the air stream is impossible,
11 obtain mounting location approval from the designer unless the contract documents
12 indicate in air stream mounting is acceptable. In no cases shall damper actuators for
13 fume exhaust systems be located in the air stream or require entering the air stream to
14 service an actuator.
- 15
- 16 K. Provide weatherproof NEMA 4 enclosures (Belimo N4 option or equal, Belimo ZS-
17 100 or ZS-150 are not acceptable) that have removable covers that have clasps or
18 machine screws (no sheet metal screws) and that do not require removing fasteners
19 from the ductwork to prevent actuator failure or freeze-up when mounting in locations
20 exposed to harsh environments or outdoor locations.
- 21
- 22 L. Size operators for smooth and positive operation of devices served, and with sufficient
23 torque capacity to provide tight shutoff against system temperatures and pressure
24 encountered. Coordinate actuator power requirements with control system. All
25 electric actuators will be provided with overload protection to prevent motor from
26 damage when stall condition is encountered. Equip operators with spring return or
27 stored energy fail-safe return for applications involving fire, freeze protection,
28 moisture protection or specified normally open/closed operation.
- 29
- 30 M. All power required for electric actuation shall be provided by this contractor if it is not
31 able to be directly provided from the DDC controller.
- 32
- 33 N. Provide operators with linkages and brackets for mounting on device served.
- 34

35 2.4 SMOKE DETECTORS

- 36
- 37 A. Smoke detectors are furnished and installed by the Electrical Contractor.
- 38

39 2.5 ACCESS DOORS

- 40
- 41 A. Access doors to be designed and constructed for the pressure class of the duct in
42 which the door is to be installed. Doors in exposed areas shall be hinged type with
43 cam sash lock. Hinges shall be aluminum or steel full length continuous piano
44 type. Doors in concealed spaces shall be secured in place with cam sash latches. For
45 both hinged and non-hinged doors provide sufficient number of cam sash latches to
46 provide air tight seal when door is closed. Do not use hinged doors in concealed
47 spaces if this will restrict access. Use minimum 1" deep 24 gauge galvanized steel
48 double wall access doors with minimum 24 gauge galvanized steel frames. For non-
49 galvanized ductwork, use minimum 1" deep double wall access door with frame that

1 shall use materials of construction identical to adjacent ductwork. Provide double
2 neoprene gasket that shall provide seals from the frame to the door and frame to the
3 duct. When access doors are installed in insulated ductwork or equipment provide
4 insulated doors with insulation equivalent to what is provided for adjacent ductwork
5 or equipment. Access doors constructed with sheet metal screw fasteners will not be
6 accepted.

7
8 B. Use insulated, 1-1/2 hour UL 1978 listed and labeled access doors in kitchen exhaust
9 ducts.

10

11 2.6 FLEXIBLE DUCT

12

13 A. Manufacturers: Anco Products, Cleavflex, Thermaflex, Flexmaster or approved equal.

14

15 B. Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or
16 less and a smoke developed rating of 50 or under in accordance with NFPA 90A.

17

18 C. Suitable for pressures and temperatures involved but not less than a 180°F service
19 temperature and ±2 inch pressure class, depending on the application.

20

21 D. Duct to be composed of polyester film, aluminum laminate or woven and coated
22 fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix.
23 Two-ply, laminated, and corrugated aluminum construction may also be used.

24

25 E. Where duct is specified to be insulated, provide a minimum 1 inch fiberglass
26 insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and
27 vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum
28 perm rating of vapor barrier jacket to be 0.1 perm.

29

30 2.7 DUCT LINING

31

32 A. Manufacturer: Manville, Owens-Corning, Knauf, or approved equal.

33

34 B. 1 inch thick, flexible, mat faced insulation made from inorganic glass fibers bonded
35 with a thermosetting resin with thermal conductivity of .25 Btu inch / hour sq.ft. deg
36 F.

37

38 C. Meet erosion testing per UL 181 or ASTM C 1071 for 5000 fpm maximum air
39 velocity. ASTM C 411 maximum operating temperature rating of 250 deg F. ASTM
40 E84 flame spread less than 25 and smoke developed less than 50.

41

42 D. Meet requirements of ASTM C 1338 and ASTM G21 for fungi resistance.

43

44 E. Install liner using adhesive conforming to ASTM C 916.

45

46 2.8 FLASHINGS

47

48 A. Provide flashing to completely weatherproof connection of ductwork to louvers.
49 Flashing to be constructed of material similar to louver material.

1
2 B. Flashing and counterflashing for roof curbs will be provided by others.

3
4 C. Flashing and curbs for duct and pipe penetrations of roof assemblies to be in
5 accordance with details.

6
7 2.9 DUCT FLEXIBLE CONNECTIONS

8
9 A. Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA
10 90A.

11
12 B. Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and
13 air tight. Connections to have adequate flexibility and width to allow for thermal
14 expansion/contraction, vibration of connected equipment, and other movement.

15
16 C. Use coated glass fiber fabric for all applications. Material to be double coated with
17 neoprene, air and water tight, suitable for temperatures between -10°F and 200°F, and
18 have a nominal weight of 30 ounces per square yard.

19
20 2.10 HOODS FOR INTAKE AND EXHAUST

21
22 A. Manufacturers: Acme, Ammerman, Carnes, Cook, Greenheck, Louvers and Dampers,
23 Penn, or approved equal.

24
25 B. Use low silhouette type hoods.

26
27 C. Construct hoods of aluminum.

28
29 D. Construct hoods of galvanized steel with a custom baked enamel finish; color to be
30 selected by the Architect during the submittal stage to match roof.

31
32 E. Provide bird screen and motor operated damper for each hood.

33
34 2.11 LOUVERS

35
36 A. Manufacturers: Airolite K6776, Industrial Louvers 658, American Warming and
37 Ventilating LE-31, Construction Specialties 6177, Ruskin ELF6375DX or approved
38 equal.

39
40 B. Similar to Airolite Type K6776, extruded aluminum alloy not less than 12 gauge
41 (.081" thick), 6063 series frame and blades, all-welded assembly, 35 degree or 45
42 degree blades with water baffle, 6 inches thick. Provide with bird screen of 1/2" x 1/2"
43 mesh aluminum in 12 gauge aluminum frame and an aluminum sill. [Locate the bird
44 screen on the outside of the louver where indicated on the drawings.] Locate the bird
45 screen inside of the louver unless noted otherwise.

46
47 C. Louver to bear the AMCA certified ratings seal for both air performance and water
48 penetration, having a free area not less than 50% based on a 48" x 48" section, a water

1 penetration less than 0.1 oz/square foot under AMCA test at 1000 feet per minute, and
2 an intake pressure drop less than 0.20 inches of water at 1000 feet per minute.

- 3
4 D. Finish to be anodized or Kynar 500 in a custom color to be selected by the Architect.
5 Furnish sufficient paint in the same color as the louver to paint the outer surface of
6 panels over unused portions of louvers and to paint the interior portion of ductwork
7 visible through the louvers.
8
9

10 **PART 3 EXECUTION**

11
12 **3.1 MANUAL VOLUME DAMPERS**

- 13
14 A. Install manual volume dampers in each branch duct and for each grille, register, or
15 diffuser as far away from the outlet as possible while still maintaining accessibility to
16 the damper. Install so there is no flutter or vibration of the damper blade(s).
17

18 **3.2 TURNING VANES**

- 19
20 A. Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA
21 standards and/or manufacturer's recommendations.
22
23 B. Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or
24 greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2 inch
25 radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm
26 or greater.
27
28 C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge
29 extension. If duct size changes in a radius elbow or if short radius elbows must be
30 used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and
31 Figure 2-6.
32

33 **3.3 CONTROL DAMPERS**

- 34
35 A. Install dampers in locations indicated on the drawings, as detailed, and according to
36 the manufacturer's instructions. Install blank-off plates or transitions where required
37 for proper mixing of airstreams in mixing plenums. Provide adequate operating
38 clearance and access to the operator. Install an access door adjacent to each control
39 damper for inspection and maintenance.
40

41 **3.4 SMOKE DETECTORS**

- 42
43 A. Installation and wiring of detectors will be by the Electrical Contractor. Install an
44 access door at each detector location.
45

46 **3.5 ACCESS DOORS**

- 47
48 A. Install access doors where specified, indicated on the drawings, and in locations where
49 maintenance, service, cleaning or inspection is required. Examples include, but are

1 not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan
2 bearings, heating and cooling coils, filters, valves, and control devices needing
3 periodic maintenance.
4

5 B. Size and numbers of duct access doors to be sufficient to perform the intended service.
6 Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size
7 for shoulder access, or other size as indicated. Install access doors on both inlet and
8 outlet sides of reheat coils as well as other duct mounted coils.
9

10 C. Label fire, smoke and combination fire smoke dampers on the exterior surface of
11 ductwork directly adjacent to access doors using a minimum of 0.5 inch height
12 lettering reading, "SMOKE DAMPER" or "FIRE DAMPER". Smoke and
13 combination fire smoke dampers shall also include a second line listing the individual
14 damper tag. The tags must be coordinated with the mechanical schedules. Utilize
15 stencils or manufactured labels. All other forms of identification are unacceptable.
16 All labels shall be clearly visible from the ceiling access point.
17

18 3.6 DUCT LINING

19

20 A. Apply lining to the following ductwork:
21 1. 10'-0" upstream of each furnace.
22 2. All transfer air ductwork.
23

24 B. Do not apply lining to the following ductwork:
25 1. Outside air ductwork.
26

27 C. Install liner in compliance with the latest edition of NAIMA's Fibrous Glass Duct
28 Liner Standard. Locate longitudinal joints at the corners of duct only. Cut and fit to
29 assure lapped, compressed joints. Coat all transverse and longitudinal joints and
30 edges with adhesive. Provide metal nosing on leading edge where lined duct is
31 preceded by unlined duct. Adhere liner to duct with full coverage area of adhesive.
32 Additionally secure liner to duct using mechanical fasteners spaced as recommended
33 by the liner manufacturer without compressing liner more than 1/8" with the fasteners.
34

35 3.7 FLASHINGS

36

37 A. Flashing for roof curbs, equipment supports or rails located on roof, will be installed
38 by others.
39

40 3.8 DUCT FLEXIBLE CONNECTIONS

41

42 A. Install at all duct connections to rotating or vibrating equipment, including furnaces,
43 energy recovery ventilators, fans, or other motorized equipment in accordance with
44 SMACNA Figure 2-19. Install thrust restraints to prevent excess strain on duct
45 flexible connections at fan inlets and outlets; see Related Work.
46

47 3.9 HOODS FOR INTAKE AND EXHAUST

48

1 A. Install in locations indicated on the drawings, coordinating the roof opening location
2 with the General Prime Contractor. Curbs are covered in Section 23 05 29.

3

4 3.10 LOUVERS

5

6 A. Furnish louvers to the General Contractor for mounting in exterior walls. Connect
7 outside air intake duct to the louver, sealing all connections air and water tight.

8

9 B. Provide bird screen on inside of active louver area where none is provided with
10 louvers. Where louvers are equipped with inside birdscreen, remove screen at all
11 locations where duct connections are not made.

12

13 C. Install insulated metal panel on unused portion of louver. Panels must be sealed
14 weathertight to louver assembly with flashing as required for proper drainage to
15 outside of building. Paint outside surface of panel to match louver prior to
16 installation. Where ductwork is visible through louver when viewed from outside the
17 building, paint inside of duct to match louver color.

18

19

END OF SECTION

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SECTION 23 34 00

HVAC FANS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions for Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for fans that are not an integral part of a manufactured device. Included are the following topics:
1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Shop Drawings
 - f. Operation and Maintenance Data
 - g. Design Criteria
 2. Part 2 – Products
 - a. General
 - b. Ceiling Exhaust Fans
 3. Part 3 – Execution
 - a. Installation
 - b. Fan Control

1.3 RELATED WORK

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment
- B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

1.4 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

1.5 QUALITY ASSURANCE

- A. Refer to Division 1, General Conditions, Equals and Substitutions.

1 1.6 SHOP DRAWINGS

- 2
- 3 A. Refer to Division 1, General Conditions, Submittals.
- 4
- 5 B. Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration
- 6 isolation for all equipment. Sound power levels to be based on tests performed in
- 7 accordance with AMCA Standard 300.
- 8
- 9
- 10 C. Submit color selection charts for equipment where applicable.
- 11
- 12 D. Fan curves shall indicate the relationship of CFM to static or total pressure for various
- 13 fan speeds. Brake horsepower, recommended selection range, and limits of operation
- 14 are to also be indicated on the curves. Indicate operating point on the fan curves at
- 15 design air quantity and indicate the manufacturer's recommended drive loss factor for
- 16 the specific application. Tabular fan performance data is not acceptable.
- 17

18 1.7 OPERATION AND MAINTENANCE DATA

- 19
- 20 A. All operations and maintenance data shall comply with the submission and content
- 21 requirements specified under section GENERAL REQUIREMENTS.
- 22

23 1.8 DESIGN CRITERIA

- 24
- 25 A. Tested and certify all fans in accordance with the applicable AMCA test code.
- 26
- 27 B. Each fan and motor combination shall be capable of delivering 110% of air quantity
- 28 scheduled at scheduled static pressure. The motor furnished with the fan shall not
- 29 operate into the motor service factor when operating under these conditions.
- 30
- 31 C. Consider drive efficiency in motor selection according to manufacturer's published
- 32 recommendation or according to AMCA Publication 203, Appendix L.
- 33
- 34 D. Where inlet and outlet ductwork at any fan is changed from that shown on the
- 35 drawings, provide any motor, drive and/or wiring changes required due to increased
- 36 static pressure or baffling necessary to prevent uneven airflow or improve mixing.
- 37
- 38 E. All internal insulation and other components exposed to the airstream are to meet the
- 39 flame spread and smoke ratings contained in NFPA 90A.
- 40

41 PART 2 PRODUCTS

42

43 2.1 GENERAL

- 44
- 45 A. Use fan size, class, type, arrangement, and capacity as scheduled.
- 46
- 47 B. Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation
- 48 devices, and accessories required for specified performance and proper operation. All
- 49 single phase motors to have inherent thermal overload protection.

- 1 C. Use OSHA approved belt guards that totally enclose the entire drive. Construct
- 2 guards of expanded metal to allow for ventilation; provide tachometer openings at
- 3 shaft locations.
- 4
- 5 D. Statically and dynamically balance all fans so they operate without objectionable
- 6 noise or vibration.
- 7

8 2.2 CEILING EXHAUST FANS

- 9
- 10 A. Manufacturers: Carnes, Greenheck or prior approved equal.
- 11
- 12 B. Centrifugal blower wheel, steel housing with acoustical lining, integral exhaust grille,
- 13 adjustable mounting brackets to allow for any ceiling thickness, electronically
- 14 communicated motor (ECM) with motor mounted fan speed dial, gravity backdraft
- 15 damper.
- 16
- 17 C. Provide roof jack discharge assembly for vertical discharge thru roof.
- 18

19 PART 3 EXECUTION

20 3.1 INSTALLATION

- 21
- 22
- 23 A. Install as shown on the drawings, as detailed, and according to manufacturer's
- 24 installation instructions.
- 25
- 26 B. Install vibration isolation hangers/brackets.
- 27
- 28 C. Turn roof jack assembly over to GC for installation.
- 29

30 3.2 FAN CONTROL

- 31
- 32 A. EF-1, EF-2 and EF-3
- 33 1. Fan shall be interlocked with space occupancy sensor / lights. Fan to operate
- 34 when occupied.
- 35
- 36 B. TF-1
- 37 1. Fan shall be controlled by a reverse acting, line voltage, non-programable
- 38 thermostat. This contractor shall provide the thermostat to the electrical
- 39 contractor. The electrical contractor shall wire and install the thermostat.
- 40

41 END OF SECTION

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SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

A. This section includes specifications for zone dampers and associated controls.
Included are the following topics:

1. Part One – General
 - a. Scope.
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Shop Drawings
 - f. Operation and Maintenance Data
 - g. Design Criteria
2. Part 2 - Products
 - a. General System Description
 - b. Zone Dampers
 - c. System Controls
 - d. System Controls (Alternate No. 2)
3. Part 3 - Execution
 - a. Installation
 - b. Adjusting

1.3 RELATED WORK

- A. Section 23 31 00 - HVAC Ducts and Casings
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23 54 00 – Gas Fired Furnaces
- D. Section 23 62 13 – Packaged Air Cooled Compressor Condensing Units

1.4 REFERENCE STANDARDS

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. ARI-ADC Standard 880

- 1 D. ASTM E84 – Surface Burning Characteristics of Building Materials
- 2 E. UL 723 – Surface Burning Characteristics of Building Materials

3
4 1.5 QUALITY ASSURANCE

- 5
- 6 A. Refer to Division 1, General Conditions, Equals and Substitutions.
- 7

8 1.6 SHOP DRAWINGS

- 9
- 10 A. Refer to Division 1, General Conditions, Submittals.
- 11
- 12 B. Contractor shall submit air terminal unit data including materials of construction,
- 13 dimensions, scheduled flow rates, pressure drops, radiated and discharge sound
- 14 power levels, reset volume controller data, actuator spring range and torque data.
- 15

16 1.7 OPERATION AND MAINTENANCE DATA

- 17
- 18 A. All operations and maintenance data shall comply with the submission and content
- 19 requirements specified under section General Requirements.
- 20

21 1.8 DESIGN CRITERIA

- 22
- 23 A. Select sizes, capacities, configuration, and operating characteristics as shown on the
- 24 plans and/or as scheduled.
- 25

26
27 PART 2 PRODUCTS

28
29 2.1 GENERAL SYSTEM DESCRIPTION

- 30
- 31 A. Manufacturers: Honeywell, Carrier, Lennox and Trane. Other systems by prior
- 32 approval only.
- 33 B. Multiple zoned control system for use with gas fired furnace and air cooled
- 34 compressor condensing unit.
- 35 C. System shall be compatible for use with:
- 36 1. Natural gas fired furnaces with:
- 37 a. Modulating gas burners
- 38 b. Variable speed blowers with ECM motors.
- 39 c. 2-stage air cooled compressor condensing units.
- 40

41 2.2 ZONE DAMPERS

- 42
- 43 A. Units shall be completely factory assembled, manufactured of 18 gauge galvanize
- 44 steel. Discharge ends shall be crimped to fit standard round ductwork. Refer to
- 45 Schedules on Drawings for inlet sizes.
- 46
- 47 B. Units shall be single duct and pressure independent.
- 48
- 49 C. Dampers:

- 1 1. Damper blade shall be constructed of 22 gauge galvanized steel.
2 2. Damper blade shall have aerodynamically designed edges to provide seal tight
3 operation at full closure without gasketing and vibration free operation at open
4 positions.
5 3. Damper blade shall be round and shall modulate a full 90 degrees from open to
6 close.

7
8 D. Electric damper actuator: 24 VAC with end switches.
9

10 2.3 SYSTEM CONTROLS

- 11
12 A. Each furnace system will be a zoned system (3 zones per furnace).
13
14 B. Each furnace zone control system will be “stand-alone” and not integrated into a BAS.
15
16 C. Integrated VAV Controller Wiring:
17 1. Factory mount and wire terminal unit controls to zone damper assemblies.
18 Mount all electrical components in terminal unit control box with removable
19 cover.
20 2. Factory mounted and tested actuator attached to casing and wired to control
21 board.

22
23 D. Electric damper actuator: 24 VAC with end switches.
24

25 E. See Section 23 54 00 for additional temperature control information.
26

27 2.4 SYSTEM CONTROLS (Alternate No. 2)

- 28
29 A. Each furnace system will be a zoned system (3 zones per furnace).
30
31 B. The furnace, zone damper and air cooled compressor condensing unit will be
32 controlled by the building automation system (BAS). See specification sections 23 09
33 14, 23 09 15, 23 09 23 and 23 09 93 for additional information.
34
35

36 PART 3 EXECUTION

37
38 3.1 INSTALLATION

- 39
40 A. Install air terminal units as indicated on project drawings and in accordance with the
41 manufacturer’s installation instructions.
42
43 B. Mount air terminal boxes with a minimum 3 feet of straight ductwork upstream of
44 inlet flow sensor for sizes 12” diameter and below. Provide a minimum of 3X the
45 inlet diameter of straight duct upstream of the inlet flow sensor for inlet sizes above
46 12” diameter.
47
48 C. Support air terminal units from building structure using sheet metal straps or trapeze
49 hanger with rods. Do not mount air terminal units off of adjacent ductwork or piping.

1 D. This contractor shall be responsible for all low voltage control and interlock wiring.

2 3.2 ADJUSTING

3

4 A. Coordinate adjustment of air terminal units with section 23 05 93 - Testing,
5 Adjusting and Balancing.

6

7

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS & GRILLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for air terminal equipment. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Submittals
 - f. Design Criteria
2. Part 2 - Products
 - a. Manufacturers
 - b. Square Ceiling Diffusers – Plaque
 - c. Plenum Slot Diffusers - 180 Degree Adjustable
 - d. Side-Wall Registers and Grilles
 - e. Door Grille
3. Part 3 - Execution
 - a. Installation

1.3 RELATED WORK

- A. Section 23 31 00 - HVAC Ducts and Casings
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

1.4 REFERENCE STANDARDS

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. ARI-ADC Standard 880

1.5 QUALITY ASSURANCE

1 A. Refer to division 1, General Conditions, Equals and Substitutions.
2

3 1.6 SUBMITTALS
4

5 A. Refer to division 1, General Conditions, Submittals.
6

7 B. Furnish submittal information including, but not limited to, the following:

- 8 1. Manufacturer's name and model number
 - 9 2. Identification as referenced in the documents
 - 10 3. Capacities/ratings
 - 11 4. Materials of construction
 - 12 5. Sound ratings
 - 13 6. Dimensions
 - 14 7. Finish
 - 15 8. Color selection charts where applicable
 - 16 9. Manufacturer's installation instructions
 - 17 10. All other appropriate data
- 18

19 1.7 DESIGN CRITERIA
20

21 A. All performance data shall be based on tests conducted in accordance with Air
22 Diffusion Council (ADC) Test Code 1062 GRD 84.
23
24

25 PART 2 PRODUCTS
26

27 2.1 MANUFACTURERS
28

29 A. Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price, and United Sheet
30 Metal.
31

32 B. Acceptable manufacturers for specific products are listed under each item.
33

34 2.2 SQUARE CEILING DIFFUSERS – Plaque
35

36 A. Titus model OMNI, Carnes series SFPA/SHPA, Price model SMDP, Metal Aire series
37 5750, and Krueger series PLQ/5PLQ.
38

39 B. Aluminum unless otherwise indicated, louvered face furnished with frame type
40 appropriate to installation.
41

42 C. Directional blow pattern as shown on the drawings and/or as scheduled.
43

44 D. One-piece removable square face plaque with one-piece backpan.
45

46 E. White, baked enamel finish or powder coat finish, unless otherwise indicated.
47

48 2.3 PLENUM SLOT DIFFUSER – 180 degree adjustable
49

- 1 A. Titus model TBD-30, Carnes model DA, Price model TBD3, Metal Aire series 6600,
2 Krueger series PTBA, Raymon-Donco Series SAT/XC.
3
- 4 B. Steel, furnished with T-bars compatible with ceiling components. Vane air pattern
5 and flow rate adjustment with air pattern having full 180-degree adjustment.
6
- 7 C. Provide 24 gauge galvanized steel (uninsulated) insulated plenum. Provide round or
8 oval inlet collar designed to fit standard flexible duct sizes.
9
- 10 D. Double metal thickness slot face.
11
- 12 E. White, baked enamel finish or powder coat finish, unless otherwise indicated. Flat
13 black diffuser vanes and frame interior.
14

15 2.4 SIDE-WALL REGISTERS AND GRILLES

- 16
- 17 A. Titus series 300 (supply) and series 350 (return/exhaust), Carnes model R series, Price
18 model 520 (Supply) or 530 (return/exhaust), Metal Aire series V4000 or H4000,
19 Krueger series 880.
20
- 21 B. Aluminum unless otherwise indicated, with frame type appropriate to installation.
22
- 23 C. Double deflection type blade supply registers and supply grilles allow deflection
24 adjustment in all direction.
25
- 26 D. Opposed blade volume control damper supply registers, operable from face.
27
- 28 E. Fixed blade (45 degree) core return and exhaust registers and grilles.
29
- 30 F. Opposed blade volume control damper return registers, operable from face.
31
- 32 G. Register and grille sizes as shown on drawings and/or as scheduled.
33
- 34 H. White, baked enamel finish or powder coat finish, unless otherwise indicated.
35
- 36 I. Screw holes on surface counter sunk to accept recessed type screws.
37

38 2.5 DOOR GRILLE

- 39
- 40 A. Titus Series 700, Carnes Series RF or RG, Metal Aire Series DG, Price ATG/STG
41
- 42 B. Aluminum. Sight tight.
43
- 44 C. Grille sizes, frame types, and finishes as shown on drawings and/or as scheduled.
45
- 46 D. White, baked enamel finish or powder coat finish, unless otherwise indicated.

1 PART 3 EXECUTION

2

3 3.1 INSTALLATION

4

5 A. Install grilles, registers and diffusers as shown on drawings and according to
6 manufacturer's instructions.

7

8 B. Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit
9 collar size.

10

11 C. Seal connections between ductwork drops and diffusers/grilles airtight.

12

13 D. Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct,
14 paint inside of duct with flat black paint to reduce visibility.

15

16

END OF SECTION

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SECTION 23 54 00

GAS FIRED FURNACES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for gas fired furnaces. Included are the following topics, not conveniently fitting into other technical sections:

- 1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Energy Efficiency
 - f. Submittals
 - g. Operation and Maintenance Data
 - h. Warranty
- 2. Part 2 - Products
 - a. Furnaces
 - b. Furnace Control
 - c. Furnace Control (Alternate No. 2)
 - d. Sequence of Operation
- 3. Part 3 - Execution
 - a. Installation
 - b. Furnaces
 - c. Sequence of Operation
 - d. Sequence of Operation (Alternate No. 2)
 - e. Training

1.3 RELATED WORK

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment
- B. Section 23 11 00 - Facility Fuel Piping

1.4 REFERENCE STANDARDS

- A. AGA American Gas Association
- B. ANSI Z21.64 Direct Vent Central Furnaces
- C. GAMA Gas Appliance Manufacturers Association

1 D. NEC National Electrical Code

2
3 1.5 QUALITY ASSURANCE

4
5 A. Refer to division 1, General Conditions, Equals and Substitutions.

6
7 1.6 ENERGY EFFICIENCY

8
9 A. Provide gas furnaces that bear the ENERGY STAR label and meet the ENERGY
10 STAR specifications for energy efficiency.

11
12 1.7 SUBMITTALS

13
14 A. Refer to division 1, General Conditions, Submittals.

15
16 B. Include specific manufacturer and model numbers, equipment identification
17 corresponding to project drawings and schedules, dimensions, capacities, materials of
18 construction, ratings, weights, power requirements and wiring diagrams, filter
19 information and information for all accessories.

20
21 1.8 OPERATION AND MAINTENANCE DATA

22
23 A. All operations and maintenance data shall comply with the submission and content
24 requirements specified under section GENERAL REQUIREMENTS.

25
26 1.9 WARRANTY

27
28 A. Furnace primary and secondary heat exchangers warranted for 20 years under normal
29 use and maintenance. Remainder of furnace components warranted for 1 year from
30 date of start up.

31
32
33 PART 2 GENERAL

34
35 2.1 FURNACES

36
37 A. Manufacturers: Bryant, Carrier, Lennox, Trane or York.

38
39 B. Direct vent, sealed combustion, condensing type AGA certified for use with natural
40 gas. Minimum annual fuel utilization efficiency (A.F.U.E.) of 95. All ratings are to
41 be certified by GAMA. All wiring shall comply with the National Electrical Code.

42
43 C. 22 gauge steel casing with baked enamel finish or prepainted galvanized steel.
44 Insulate casing back and side panels with foil faced fiberglass insulation.

45
46 D. Construct primary heat exchanger of aluminized steel. Construct secondary heat
47 exchanger of stainless steel with aluminum fins or of polypropylene laminated steel.
48 Aluminized steel multi-port in-shot burner with hot surface or electronic spark
49 ignition, approved for vertical or sidewall venting.

- 1 E. AGA listed gas controls including manual main shut-off valve, double automatic gas
2 valves for redundancy and gas pressure regulator.
- 3 F. Centrifugal type blower fan statically and dynamically balanced with multiple speed,
4 direct drive or belt drive fan motor. Provide low energy induced draft blower for heat
5 exchanger prepurge and combustion gas venting.
- 6
- 7 G. Provide unit with 2" thick 30% efficient disposable type panel air filter and filter
8 holding rack with a maximum filter face velocity of 500 fpm.
- 9
- 10 H. Provide solid state integral control unit with all necessary controls and relays
11 including but not limited to:
 - 12 1. Pressure switch for airflow of flue products through furnace and out vent system
 - 13 2. Rollout switch with manual reset to prevent over temperature in burner area
 - 14 3. Electronic flame sensor
 - 15 4. Blower access safety interlock
 - 16 5. Timed blower start after main burners ignite
 - 17 6. Factory installed 24 v transformer for controls and thermostat
 - 18 7. LED's to indicate status and to aid in troubleshooting
- 19
- 20 I. Provide unit with matching cased "A" configuration cooling coil.
- 21
- 22 J. Minimum 1/2" OD seamless copper tubing mechanically bonded to heavy ripple
23 edged aluminum fins with thermal expansion valve, holding charge and copper tube
24 stubs for field piping.
- 25
- 26 K. Non-corrosive stainless steel or polymer drain pan with 3/4" NPT drain connection.
- 27
- 28 L. 20 gauge steel Coil casing with baked enamel finish and fiberglass insulation.
- 29

30 2.2 FURNACE CONTROL

- 31
- 32 A. Provide "stand-alone" variable air volume control system for each furnace.
- 33
- 34 B. Control System Manufacturers: Carrier (Infinity). Similar system by Honeywell,
35 Carrier, Lennox and Trane. Other systems by prior approval only.
- 36
- 37 C. General
 - 38 1. Provide multiple zone (3 per furnace) control system for each furnace / air cooled
39 compressor condensing unit system.
 - 40 2. System shall be compatible for use with and control of:
 - 41 a. Natural gas fired furnace with modulating gas burner.
 - 42 b. Variable speed blower with ECM motor.
 - 43 c. 2-stage air cooled compressor condensing unit.
 - 44 d. Minimum outside air damper.
 - 45 e. Enabling of energy recovery ventilator (furnace F-1 only).
 - 46 3. System shall be digital with central controller Wi-Fi enabled for:
 - 47 a. Remote access.
 - 48 b. Software updates.
 - 49

1 D. Central Controller

- 2 1. Digital screen.
3 2. 7-day programmability.
4 3. Integration of temperature, humidity and ventilation.
5 4. Ability to satisfy simultaneous heating and cooling demands.
6 5. Timed override schedules.
7 6. Integration and control of zone dampers, 2-stage ACCU, modulating gas burner
8 and outside air damper (ERV).
9

10 E. Zone Sensors

- 11 1. Digital with user adjustment.
12 2. To include temperature adjustment, override and unoccupied features.
13 3. Keypad lock.
14

15 2.3 FURNACE CONTROL (Alternate No. 2)

- 16
17 A. Each furnace will be used in a zoned system (3 zones per furnace).
18
19 B. The furnace, zone dampers and air cooled compressor condensing unit will be
20 controlled by the building automation system (BAS). See specification sections 23 09
21 14, 23 09 15, 23 09 23, and 23 09 93 for additional information.
22
23

24 PART 3 EXECUTION

25
26 3.1 INSTALLATION

- 27
28 A. Install units as shown on plans, as detailed and according to the manufacturer's
29 installation instructions.
30
31 B. Pipe vents from gas regulator to outside (where regulators are provided).
32
33 C. Install remote panels and thermostats where indicated on the drawings. Provide all
34 wiring between remote panels/thermostats and the gas fired item.
35
36 D. Provide all required control wiring.
37

38 3.2 FURNACES

- 39
40 A. Install on steel stand. Pipe condensate to floor drain.
41
42 B. Provide schedule 40 PVC, ASTM D1785 combustion air and vent piping and fittings
43 with solvent welded joints as indicated on the drawings. Terminate as recommended
44 by the furnace manufacturer up thru roof.
45

46 3.3 SEQUENCE OF OPERATION

- 47
48 A. The central controller shall control all operation of the system including:
49 1. Occupied and unoccupied modes of each furnace.

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SECTION 23 62 13

PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSING UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for air cooled condensing units for use with split system type air conditioning. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Submittals
 - f. Operation and Maintenance Data
 - g. Delivery, Storage and Handling
 - h. Warranty
2. Part 2 – Product
 - a. Units up to 5 Tons
 - b. Refrigerant Piping Specialties
3. Part 3 – Execution
 - a. Installation
 - b. Control
 - c. Control (Alternate No. 2)
 - d. Startup
 - e. Training

1.3 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC

1.4 REFERENCE STANDARDS

- A. ARI 210/240 Unitary Air Conditioning and Heat Pump Equipment
- B. ARI 365 Commercial and Industrial Unitary Air Conditioning Condensing Units
- C. ASHRAE 15 Safety Standard for Refrigeration Systems
- D. ASHRAE 90.1 (2004 edition) Energy Standard for Buildings Except Low Rise Residential Buildings

1 E. NEC National Electrical Code

2
3 F. ASTM B117 Standard Practice for Operating Salt Spray (fog) Apparatus

4
5 G. UL Underwriters Laboratory

6
7 1.5 QUALITY ASSURANCE

8
9 A. Refer to Division 1, General Conditions, Equals and Substitutions.

10
11 B. Unit Energy Efficiency Ratio (EER), Coefficient of Performance (COP) and
12 Integrated Part Load Value (IPLV) shall meet the minimum applicable requirements
13 of ASHRAE 90.1(2010 edition). Units that are labeled ENERGY STAR® will be
14 acceptable.

15
16 C. Rate unit performance in accordance with the latest edition of ARI Standard 365 or
17 ARI Standard 210/240, whichever is applicable for the equipment.

18
19 D. Construct units in accordance with ASHRAE 15, UL standards and the NEC. Units
20 shall carry the UL label.

21
22 E. Factory run test units to see that each control device operates properly. Pressure test,
23 evacuate, charge with holding charge of refrigerant and full oil charge prior to
24 shipping from the factory.

25
26 1.6 SUBMITTALS

27
28 A. Refer to Division 1, General Conditions, Submittals

29
30 B. Submit air cooled condensing unit shop drawings including the following information:
31 specific manufacturer and model numbers, dimensional and weight data, required
32 clearances, materials of construction, capacities and ratings, stages of unloading
33 capacity achievable without hot gas bypass (and with hot gas bypass if applicable),
34 refrigerant type and charge, component information, size and location of piping
35 connections, electrical connections, wiring diagrams and information for all
36 specialties and accessories.

37
38 C. Submit manufacturer's installation and start-up instructions, maintenance data,
39 troubleshooting guide, parts lists, controls and accessories.

40
41 D. At substantial completion, submit warranty certificate and copy of start-up report.

42
43 1.7 OPERATION AND MAINTENANCE DATA

44
45 A. All operations and maintenance data shall comply with the submission and content
46 requirements specified under section GENERAL REQUIREMENTS.

47
48 1.8 DELIVERY, STORAGE AND HANDLING

1 A. Comply with manufacturer's instructions for storing, rigging, unloading, and
2 transporting units. Protect units from physical damage. Leave factory-shipping
3 covers in place until installation.

4
5 B. Ship units to jobsite fully assembled

6
7 1.9 WARRANTY

8
9 A. Provide a one year parts and labor warranty on the entire unit beginning upon
10 substantial completion of project.

11
12 B. Provide a five year parts warranty on the compressor(s) beginning upon substantial
13 completion of project.

14
15
16 PART 2 PRODUCTS

17
18 2.1 UNITS UP TO 5 TONS

19
20 A. Manufacturers: Carrier, Lennox, Trane, York, Diakin or approved equal.

21 1. Provide factory assembled, outdoor mounted, air-cooled condensing unit suitable
22 for on grade installation. Include compressor, air cooled condenser, refrigerant,
23 lubrication system, interconnecting wiring, safety and operating controls, motor
24 starting components and additional features as specified herein or required for
25 safe, automatic operation. Refrigerant shall be R-410A.

26
27 B. CABINET

28 1. Construct cabinet of heavy gauge, galvanized steel coated with weather resistant
29 paint. Provide removable access panels to facilitate full access to the
30 compressor, fan and control components.

31
32 C. COMPRESSOR

33 1. Provide two-stage scroll type compressor with built in motor winding
34 temperature and current protection, liquid and suction service valves, gage ports,
35 sight glass and liquid line filter dryer. Provide crankcase heater with
36 reciprocating type compressors. Mount compressors on vibration isolators.

37
38 D. CONDENSER

39 1. Provide condenser coils with aluminum alloy plate fins mechanically fastened to
40 seamless copper tubing with integral subcooler. Construct coils with design
41 working pressure suitable for the refrigerant.

42 2. Provide with ECM motor and direct-drive, statically and dynamically balanced
43 propeller type fans with vertical or horizontal discharge as indicated on the
44 drawings and guards constructed of heavy gage PVC coated wire or galvanized
45 steel.

46
47 E. POWER WIRING

48 1. Provide factory installed 24-volt control circuit with fusing; control power
49 transformer and all associated internal wiring. Provide a single point power

1 connection to the unit(s). Provide factory installed magnetic contactors for
2 compressor and condenser motors.

3 2. Electrical characteristics shall be as indicated in the equipment schedule.
4

5 F. CONTROLS

6 1. Provide high/low refrigerant pressure cutouts with manual reset and anti-short
7 cycle compressor timer.

8 2. Units must be capable of operating down to ambient temperature of 30 deg F.
9 Provide low ambient lockout to prevent compressor from operating below 30
10 degrees.
11

12 2.2 REFRIGERANT PIPING SIZING
13

14 A. The unit manufacturer shall provide all *refrigeration pipe sizing* process to insure
15 conformance to specific unit requirements such as max lengths, refrigerant velocities,
16 unloading considerations and proper oil return. This contractor shall provide
17 refrigeration piping drawings from the field which details the way the piping will
18 actually be installed.
19

20 2.3 REFRIGERANT PIPING ACCESSORIES
21

22 A. Provide all refrigerant piping specialties with a maximum working pressure of full
23 vacuum to 450 psig and a maximum working temperature of 225 degrees F. For
24 systems using R-410A, provide all refrigerant piping specialties with a maximum
25 working pressure of full vacuum to 850 psig and a maximum working temperature of
26 225 degrees F.
27

28 B. Flexible pipe connectors: Double braided bronze hose flexible pipe connectors with
29 solder end connections.
30

31 C. Filter Dryers: For circuits 15 tons and over provide angle pattern filter dryers with
32 replaceable core. For circuits below 15 tons provide straight pattern filter dryers
33 without replaceable core.
34

35 D. Sight glasses: Two piece brass construction with solder end connections. Include
36 color indicator for sensing moisture.

37 E. Solenoid Valves: Two way normally closed with two piece brass body, full port,
38 stainless steel plug, stainless steel spring, teflon diaphragm and solder end
39 connections. Provide replaceable coil assembly.
40

41 F. Hot Gas Bypass Valves: Provide with integral solenoid valve, external equalizer
42 connection and adjustable pilot assembly.
43

44 G. Thermostatic Expansion Valves: Brass body, bronze disc, neoprene seat, bronze
45 bonnet, stainless steel spring and solder end connections.
46

47 H. Charging Valves: Provide 1/4" SAE brass male flare access ports with finger tight,
48 quick seal caps. Provide 2-inch long copper extension sections.
49

- 1 I. Check valves: Spring loaded type with bronze body, bronze disc, neoprene seat,
2 bronze bonnet, stainless steel spring and solder end connections.
3

4 PART 3 EXECUTION
5

6 3.1 INSTALLATION
7

- 8 A. Install units, piping and accessories in accordance with the manufacturer's written
9 instructions and recommendations. Mount unit(s) on a poured concrete pad on grade
10 as indicated on the drawings.
11
12 B. Maintain adequate service access and airflow clearances for all components as
13 recommended by the manufacturer and as indicated on the drawings.
14
15 C. Charge unit(s) with full oil charge and refrigerant charge based on the entire
16 refrigeration system pipe size and length.
17
18 D. Coordinate power wiring requirements with the electrical trade.
19

20 3.2 CONTROL
21

- 22 A. Units will be controlled by the furnace stand-alone zoned control system. Section 23
23 54 00.
24

25 3.3 CONTROL (Alternate No. 2)
26

- 27 A. Units will be controlled thru the building automaton system (BAS).
28
29 B. Provide all control wiring in conduit in compliance with Section 23 09 14, 23 09 15
30 and Division 26 00 00 - Electrical.
31

32 3.4 STARTUP
33

- 34 A. Adjust units for maximum operating efficiency, adjust all controls to required final
35 settings and demonstrate that all components are functioning properly. Submit four
36 copies of a written startup report following the initial start up. Include in the report:
37 work done to the system, all readings taken, a statement certifying that the
38 refrigeration system(s) are leak free and a statement certifying that the unit(s) have
39 been placed in proper running condition as recommended by the manufacturer and as
40 intended in the drawings and specifications.
41

42 3.5 TRAINING
43

- 44 A. Contractor to provide factory authorized representative and/or field personnel
45 knowledgeable with the operations, maintenance and troubleshooting of the system
46 and/or components defined within this section for a minimum period of 3 hours.
47
48

49 END OF SECTION

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SECTION 23 72 00

AIR TO AIR ENERGY RECOVERY EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions for Division 1 shall govern all work under this section.

1.2 SCOPE

- A. This section includes specifications for energy recovery equipment that is used to recover heating and/or cooling energy. Included are the following topics:

1. Part 1 – General
 - a. Scope
 - b. Reference
 - c. Related Work
 - d. Quality Assurance
 - e. Submittals
 - f. Operation and Maintenance Data
 - g. Design Criteria
2. Part 2 - Products
 - a. Air-to-Air Heat Exchangers (Fixed plate type)
3. Part 3 – Execution
 - a. Installation
 - b. Air-to-Air Heat Exchangers (Fixed plate type)
 - c. Sequence of Control
 - d. Sequence of Control (Alternate No. 2)
 - e. Owner Training

1.3 RELATED WORK

- A. Section 23 07 00 - HVAC Insulation
- B. Section 23 33 00 - Air Duct Accessories

1.4 QUALITY ASSURANCE

- A. Refer to Division 00 and 01.

1.5 SUBMITTALS

- A. Refer to Division 00 and 01.
- B. Include unit dimensions, weights, materials of construction, thermal characteristics, ratings, fabrication methods, manufacturer's installation requirements, and appropriate identification.

1 1.6 OPERATION AND MAINTENANCE DATA
2

- 3 A. All operations and maintenance data shall comply with the submission and content
4 requirements specified under section GENERAL REQUIREMENTS.
5

6 1.7 DESIGN CRITERIA
7

- 8 A. Capacity, efficiency, and operating characteristics as indicated on the drawings and/or
9 as scheduled.
10

11 PART 2 PRODUCTS
12

13 2.1 AIR TO AIR HEAT EXCHANGERS (FIXED PLATE)
14

15 A. Manufacturers

- 16 1. Renewaire, Greenheck, Cook or prior approved equal.
17

18 B. Design

- 19 1. The ERV shall be capable of transferring both sensible and latent energy between
20 airstreams. Latent energy transfer shall be accomplished by direct water vapor
21 transfer from one airstream to the other, without exposing transfer media in
22 succeeding cycles directly to the exhaust air and then to the fresh air.
23

24 C. Casing

- 25 1. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped
26 corners and zinc plated screw fasteners.
27 2. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors
28 shall have an airtight compression seal using closed cell foam gaskets. Pressure
29 taps, with captive plugs, shall be provided allowing cross-core pressure
30 measurement allowing for accurate airflow measurement.
31 3. Case walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim
32 faced, high-density fiberglass board insulation, providing a cleanable surface and
33 eliminating the possibility of exposing the fresh air to glass fibers, and with
34 minimum R-value of 4.3 (hr·ft²·°F/BTU).
35

36 D. Heat Transfer Surface

- 37 1. The energy recovery component shall be of fixed-plate cross-flow construction,
38 with no moving parts.
39

40 E. Filters

- 41 1. Furnish 2" MERV 8 pleated filters and filter track on both entering air sides of
42 unit. Filter rack may be integral with unit or installed independently in duct
43 upstream of unit.
44

45 F. Motors

- 46 1. Blower motors shall be ECM controlled motors allowing two preset speeds or
47 variable speed operation with a 0-10 volt DC control signal.

- 1 2. Blowers shall be quiet running, forward curve type. Belt drive motors shall be
2 provided with adjustable pulleys and motor mounts allowing for blower speed
3 adjustment, proper motor shaft orientation and proper belt tensioning.
4
5 G. Isolation Dampers
6 1. Provide factory isolation dampers for both air streams. The insulated dampers
7 shall be of a low leakage design and shall not restrict the airstream, reducing
8 airflow, in any way. The dampers shall be opened with a motor actuator powered
9 by the standard unit transformer package and have a spring return for low off-
10 position power consumption.
11
12 H. Electrical
13 1. The unit electrical box shall include a factory installed, non-fused disconnect
14 switch and a 24 VAC, Class II transformer/relay package.
15 2. Unit shall have single-point power connection and a single-point 24 VAC
16 contactor control connection.
17
18 I. Controls
19 1. Unit shall perform without condensing or frosting under normal operating
20 conditions (defined as outside temperatures above -10 degree F and inside
21 relative humidity below 40%). Occasional extreme conditions shall not affect the
22 usual function or performance of the element. No Condensate drains will be
23 allowed. Unit shall have the capacity to operate continuously without the need
24 for bypass, recirculation, preheaters, or defrost cycles under normal operating
25 conditions.
26 2. Provide with integrated programmable controller.

27
28 PART 3 EXECUTION

29
30 3.1 INSTALLATION

- 31
32 A. Install units in accordance with unit manufacturer's installation requirements in
33 locations indicated on the drawings and as detailed.
34
35 B. Provide equipment stand for unit mounting.
36
37 C. Install analog "filter" gauges for both airstreams.
38

39 3.2 AIR-TO-AIR HEAT EXCHANGERS (Fixed Plate Type)

- 40
41 A. Coordinate insulation of unit casing with section 23 07 00 so that the casing is
42 insulated in the manner specified.
43
44 B. Install filter rack with panel filters where supply and exhaust airstreams enter units if
45 units do not already have filters provided or installed.
46
47

1 3.3 SEQUENCE OF CONTROL
2

- 3 A. Unit control will not be integrated into a BAS.
4
5 B. All controls shall be provided by the Division 23 contractor.
6
7 C. Unit shall be enabled/disabled via Furnace stand-alone control system. See Section 23
8 54 00.
9
10 D. When energized by the furnace system, the outside air and exhaust air dampers shall
11 open and the unit shall have two modes of operation: "Standard" Ventilation and
12 "Assembly" ventilation.
13
14 E. The normal mode of operation shall be "Standard" ventilation.
15
16 F. Provide momentary switch with pilot light and timer (90 min/adjustable) for
17 occupants to enter "Assembly" ventilation mode.
18
19 G. When the user activates "Assembly" mode via the space mounted switch, the ERV
20 supply and exhaust fans shall increase speed to provide "Assembly" ventilation.
21
22 H. Upon expiration of the switch/timer, the unit shall move back to "Standard"
23 ventilation.
24
25 I. The ERV shall be "off" and exhaust air and outside air dampers closed whenever the
26 furnace system is in the "unoccupied" mode.
27

28 3.4 SEQUENCE OF CONTROL (Alternate No. 2)
29

- 30 A. All controls shall be provided by the Division 23 contractor.
31
32 B. The unit will be controlled by the building automation system (BAS). See sections 23
33 09 15, 23 09 23 and 23 09 93.
34

35
END OF SECTION

SECTION 23 82 00

HEATING AND COOLING TERMINAL UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 1 shall govern all work under this section.

1.2 SCOPE

A. This section includes specification for heating and cooling terminal equipment using electric as the source. Included are the following topics:

1. Part One – General
 - a. Scope
 - b. Related Work
 - c. Reference Standards
 - d. Quality Assurance
 - e. Shop Drawings
 - f. Operation and Maintenance Data
 - g. Design Criteria
2. Part 2 – Products
 - a. Electric Unit Heaters
 - b. Electric Radiant Ceiling Panels
 - c. Electric Baseboard
 - d. Electric Ceiling/Wall Heaters
3. Part 3 – Execution
 - a. Installation
 - b. Electric Unit Heaters
 - c. Electric Radiant Ceiling Panels
 - d. Electric Baseboard
 - e. Electric Ceiling/Wall Heaters

1.3 RELATED WORK

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

1.4 REFERENCE STANDARDS

- A. ARI 210 Standard for Unitary Air-Conditioning Equipment
- B. ARI 410 Standard for Forced-Circulation Air-Cooling and Air-Heating Coils
- C. CS 140

1.5 QUALITY ASSURANCE

1 A. Refer to division 1, General Conditions, Equals and Substitutions

2
3 1.6 SHOP DRAWINGS

4
5 A. Refer to division 1, General Conditions, Submittals.

6
7 B. Include dimensions, capacities, materials of construction, ratings, weights, wiring
8 diagrams, and appropriate identification for all equipment in this section. Include
9 color selection chart where applicable.

10
11 1.7 OPERATION AND MAINTENANCE DATA

12
13 A. All operations and maintenance data shall comply with the submission and content
14 requirements specified under section GENERAL REQUIREMENTS.

15
16 1.8 DESIGN CRITERIA

17
18 A. Electrical Equipment and heaters shall be UL listed for the service specified.

19
20 B. Electrical components and work must be in accordance with National Electrical Code.

21
22
23 PART 2 PRODUCTS

24
25 2.1 ELECTRIC UNIT HEATERS

26
27 A. Manufacturers: Q Mark, Berko, Markel or approved equal.

28
29 B. Unit casing

30 1. Steel with corrosion resistant coating and/or finished in baked enamel with
31 integral unit support points. Units shall have individually adjustable horizontal
32 and vertical discharge louvers.

33 2. Heating Element

34 a. Resistance type metal sheath finned tube in control steps as shown.

35 3. Fan & Motor

36 a. Propeller type fan direct connected to a totally enclosed motor with internal
37 motor overload protection and safety fan guard.

38 b. The fans and motors shall be balanced and mounted for vibration free
39 operation.

40 4. Control

41 a. Provide units with necessary overheat protection, reset devices, air flow
42 interlock switch, contactors, transformers, local non-fused disconnect switch
43 that is prewired, and other controls as may be required by codes.

44 b. Maintain fan operation until residual heat in the heating elements has been
45 dissipated.

46 c. Automatic resetting overheat cut-out, and a remote mounted, adjustable, line
47 voltage room thermostat with a 40°F to 80°F range.

- 1 2.2 ELECTRIC BASEBOARD
2
3 A. Manufacturers: Q Mark, Berko, Markel, Runtal or approved equal.
4
5 B. Enclosure
6 1. Formed steel with bottom front air inlet and top air outlet, corrosion resistant
7 prime coat and a baked enamel finish coat. Provide units with joining strips, end
8 caps, pedestal mounts, column enclosures and inside and outside corners as
9 required for the installation. Provide blank sections of enclosure only where
10 indicated.
11
12 C. Heating Element
13 1. Low density, cool operating, finned, convective type, corrosion resistant heating
14 element, designed and spaced for even distribution of air across the heating
15 element, and installed to prevent noise of expansion and contraction. Exposed
16 surfaces to touch shall not exceed 120° F.
17
18 D. Controls and electrical components
19 1. Unit control will not be integrated into a BAS.
20 2. Integral high temperature cut-out, wiring junction box with knockouts for wiring
21 and an integral, adjustable low voltage thermostat with return air, below element
22 temperature sensor.
23 3. Provide digital, line-voltage 7-day heating only programmable thermostat.
24 4. Turn thermostats over to electrical contractor for installation.
25
26 E. Controls and electrical components (Alternate No. 2)
27 1. Control of units will be via the building automation system (BAS). See sections
28 23 09 14, 23 09 15, 23 09 23 and 23 09 93.
29 2. Integral high temperature cut-out, wiring junction box with knockouts for wiring
30 and an integral, adjustable low voltage thermostat with return air, below element
31 temperature sensor.
32 3. Provide each unit with a power relay with 24 volt operating coil or provide power
33 relays to control the indicated quantities of electric baseboard heaters as shown
34 on the drawings. Power relays shall be sized accordingly to control the indicated
35 or required quantities of electric baseboard heaters.
36 4. Turn thermostats over to electrical contractor for installation.
37
- 38 2.3 ELECTRIC CEILING/WALL HEATERS
39
40 A. Manufacturers: Q Mark, Berko, Markel or approved equal.
41
42 B. Enclosure
43 1. Corrosion resistant 18 gauge steel for surface or recessed mounting as indicated
44 with louvered front panel with baked on enamel satin finish or anodized
45 aluminum trim frame with anodized aluminum louvered front panel.
46
47 C. Heater and Fan

- 1 1. Prewired assembly with propeller fan and direct connected motor and finned tube
2 type corrosion resistant heating element, installed to prevent noise of expansion
3 and contraction. The fan and motor shall be balanced and mounted for vibration
4 free operation.
- 5 2. The fans and motors shall be balanced and mounted for vibration free operation.

6
7 D. Control

- 8 1. Provide units with necessary overheat protection, reset devices, air flow interlock
9 switch, contactors, transformers, local non-fused disconnect switch that is
10 prewired, and other controls as may be required by codes.
- 11 2. Maintain fan operation until residual heat in the heating elements has been
12 dissipated.
- 13 3. Built-in fan motor delay switch, motor overload protection device, automatic
14 reset high limit heater safety switch, non-fused electrical disconnect switch,
15 transformers and integral adjustable thermostat.

16
17
18 PART 3 EXECUTION

19
20 3.1 INSTALLATION

- 21 A. Install units in accordance with manufacturer's installation instructions.
- 22 B. Coordinate location of units with other trades to assure correct recess size for recessed
23 units.
- 24 C. After installation, provide protective covers to prevent accumulation of dirt on units
25 during balance of construction.
- 26 D. Power wiring for all units will be provided by the Electrical Contractor. This
27 contractor shall be responsible for providing all low voltage control wiring.
- 28 E. Protect all finishes from damage during construction.

29
30
31
32
33 3.2 ELECTRIC UNIT HEATERS

- 34 A. Suspend units from building structure and as high as possible to maintain headroom
35 beneath units.

36
37 3.3 ELECTRIC BASEBOARD

- 38 A. The baseboard heaters shall be securely mounted on the floor or against the wall
39 surface in accordance with the Manufacturer's instructions.
- 40 B. Electrical contractor to provide all line voltage wiring

41
42 3.4 ELECTRIC CEILING/WALL HEATERS

- 43 A. Install units at locations as indicated on the drawings and as detailed.

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- B. The bottom of the heaters shall be mounted approximately 8 inches above the finished floor line. Securely mount the unit enclosure to the wall at the locations shown, except that due consideration and coordination shall be given to any interferences with other construction.
- C. Units shall be recessed or surface mounted as indicated on the plan schedule.
- D. Units should not be specified with recessed mounting when located on a fire rated or masonry wall. Units can be recessed in a masonry wall, however coordination with the Architect and/or Structural Engineer will be required.

END OF SECTION

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SECTION 26 05 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 GENERAL PROVISIONS

- A. In general, the work includes: Electrical work and the kindred materials and operations as indicated on the drawings and as specified in the following articles of Section 26 05 00, 26 09 23, 26 20 00, 26 43 13, 26 51 13, 27 10 00, and 28 31 00.

- B. Job Information: Obtain at building including:
1. Conditions affecting this Section of the Work.
 2. Accessibility
 3. Storage space.

1.03 GENERAL REQUIREMENTS

- A. This Section of the Specifications applies to all electrical work. The General Conditions, Supplementary Conditions, Summary of the Work, Instructions to Bidders and all Sections of the Conditions of the Contract form a part of these specifications and the Contractor shall consult them in detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical Contractor shall be included in the Work of this Section.

1.04 DEFINITIONS

- A. Certain terms used herein; on the drawings; and in the contract documents, shall be defined as follows
- B.
- C. Provide: Furnish and install complete and ready for service.
- D. Exposed: Exposed to view in any room, hallway, passageway, or outside.
- E. Approval: The approval of the Architect in writing or by signed rubber stamp applied to drawings, illustrations, etc.

1.05 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

- 1 1.06 DRAWINGS
2
3 A. The Electrical drawings do not attempt to show the complete details of building construction
4 which affect the electrical installation. The Contractor shall refer to the architectural, civil,
5 structural and mechanical drawings for additional details which affect the proper installation of
6 this work. The Contractor is cautioned that diagrams showing electrical connections and/or
7 circuiting are diagrammatic only and must not be used for obtaining lineal runs of wire to
8 conduit. Wiring diagrams do not necessarily show the exact physical arrangement of the
9 equipment.
10
- 11 1.07 MATERIAL AND EQUIPMENT
12
13 A. All material and equipment shall be new and of the quality used for the purpose in good
14 commercial practice, and shall be standard product of reputable manufacturers. Each major
15 component of equipment shall have the manufacturer's name, catalog number, and capacity or
16 rating on a nameplate, securely affixed on the equipment in a conspicuous place.
17
- 18 1.08 SUBSTITUTION AND APPROVAL OF MATERIAL
19
20 A. See Instructions to Bidders.
21
22 B. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings
23 and descriptions of material proposed for substitution and shall fully describe all points in which
24 it differs from the articles specified. Two copies will be retained by the Architect and one copy
25 returned to the Contractor with approval or revisions indicated thereon.
26
- 27 1.09 DAMAGE TO OTHER WORK
28
29 A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own
30 or any other trade resulting from the execution of his work. It shall be the Contractor's
31 responsibility to adequately protect his work at all times. All damages resulting from his
32 operations shall be repaired or the damaged portions replaced by the party originally performing
33 the work, (to the entire satisfaction of the Architect), and all cost thereof shall be borne by the
34 Contractor responsible for the damage.
35
- 36 1.10 COOPERATION WITH OTHER TRADES
37
38 A. This Contractor shall completely cooperate with all other trades in the matter of planning and
39 executing of the work. Every reasonable effort shall be made to prevent conflict and
40 interferences as to space requirements, dimensions, locations, openings, sleeving or other
41 matters which tend to delay or obstruct the work of any trade.
42
- 43 1.11 NEGLIGENCE
44
45 A. Should the Contractor fail to provide materials, templates, etc., or other necessary information
46 causing delay or expense to another party, he shall pay the actual amount of the damages to the
47 party who sustained the loss.
48
- 49 1.12 FIELD CHANGES
50
51 A. Should any change in drawings or specifications be required to comply with local regulations
52 and/or field conditions, the Contractor shall refer same to Architect for approval before any
53 work which deviates from the original requirements of the drawings and specifications is
54 started. In the event of disagreements as to the necessity of such changes, the decision of the
55 Architect shall be final.

- 1 1.13 CUTTING AND PATCHING IN NEW CONSTRUCTION
2
3 A. As necessary and with approval to permit the installation of conduit or any part of the work
4 under this branch. Any cost caused by defective or ill-timed work shall be by the party
5 responsible therefor. Patching of holes, openings, etc. resulting from the work of this branch
6 shall be furnished by this contractor.
7
8 B. See Division 1 for additional requirements.
9
10 C. See also "Demolition, Renovation, and Disposition of Existing Equipment" in this Section.
11
12 1.14 COMPLETION DATES
13
14 A. This Contractor shall be in a position to meet all completion dates established by the Architect
15 and shall furnish all labor of all classes required to meet such schedules and completion dates.
16
17 1.15 STANDARDS, CODES AND PERMITS
18
19 A. All work shall be installed in accordance with National, State and Local electrical codes, laws,
20 ordinances and regulations. Comply with all applicable OSHA regulations.
21
22 B. All materials shall have a U.L. label where a U.L. standards and/or test exists.
23
24 C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and
25 working drawings required by them.
26
27 D. Secure and pay for all permits and licenses required.
28
29 1.16 CLEAN-UP
30
31 A. This Contractor shall at all times keep the premises free from excessive accumulation of waste
32 material or rubbish resulting from his work, including tools, scaffolding and surplus materials,
33 and he shall leave his work broom clean or its equivalent.
34
35 B. In case of dispute, Architect may order the removal of such rubbish and charge the cost to the
36 responsible contractor as determined by the Architect. At the time of final clean-up all fixtures
37 and equipment shall be thoroughly cleaned and left in proper condition for their intended use.
38
39 1.17 TESTS
40
41 A. The Contractor shall provide all instrumentation, labor and conduct all tests required by the
42 Architect. All tests shall be made before any circuit or item of equipment is permanently
43 energized. Circuits shall be phased out and loads shall be distributed as evenly as possible on
44 all phases. All phase conductors shall be entirely free from grounds and short circuits. All
45 instrumentation and personnel required for testing shall be provided by the Contractor and all
46 tests shall be conducted in the presence of the Architect or his authorized representative.
47
48 B. System Tests:
49 1. The following tests are required prior to energization of the electrical system:
50 a. Secondary feeders shall have an insulation resistance test utilizing a megger
51 applying a test potential of 500 volts DC minimum.
52 b. Establish secondary phase to ground voltages.
53 c. Establish proper phase relationship and motor rotation.
54

- 1 2. The following tests are required under normal load condition:
2 a. Record secondary phase to phase and phase to ground voltages and phase
3 currents at all major equipment, apparatus, and on all secondary feeders.
4 Voltage readings shall be taken at line side terminals of distribution centers
5 and panelboards.
6 b. Confirm proper phase relationship and motor rotation.
7 c. Confirm load balance at distribution centers and panels. Rebalance load if
8 necessary such that the minimum unbalance between phases shall not exceed
9 7-1/2%.
10 d. Confirm operation of all electrically operated apparatus, such as circuit
11 breakers, transfer switches, etc., by exercising same under load.
12 e. Record all settings and calibrations of circuit breakers, transfer switches,
13 transformers, meters, timing devices, etc.

- 14
15 C. Records:
16 1. All test data obtained by the E.C. or manufacturer/supplier shall be recorded and filed
17 with the maintenance manual as part of permanent job records. Test data shall include
18 identification of instruments employed (field test only), condition of test (time, date,
19 weather, etc.), parameters of test, personnel conducting test, and any pertinent
20 information or conditions noted during the test.

21
22 1.18 SHOP DRAWINGS

- 23
24 A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment
25 brochure depicting:
26 1. Lighting Fixtures
27 2. Panelboards
28 3. Occupancy Sensors
29 4. Fire Alarm System Devices
30 5. Telecommunications Equipment and Cabling
31 6. Wiring Devices
32 7. Floor Boxes
33 8. Lighting Controls
34 9. Surge Protection Device
35 10. Other materials at the request of the Engineer

36 B. See Section 01300.

37 C. Shop drawings shall bear the Contractor's stamp indicating approval.

38
39 D. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.
40

41
42
43 1.19 WORKMANSHIP

- 44
45 A. The installation of all work shall be made so that its several component parts will function as a
46 workable system complete with all accessories necessary for its operation, and shall be left with
47 all equipment properly adjusted and in working order. The work shall be executed in
48 conformity with the best accepted standard practice of the trade so as to contribute to efficiency
49 and appearance. It shall also be executed so that the installation will conform and adjust itself to
50 the building structure, its equipment and its usage.
51
52

- 1 1.20 DRAWINGS OF OTHER TRADES
2
3 A. The Contractor shall consult the drawings of the work for the various other trades; field layouts
4 of the parties performing the work of the other trades; their shop drawings, and he shall be
5 governed accordingly in laying out his work
6
7 B. Specifically examine shop drawings to confirm voltage, current characteristics, and other wiring
8 requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.
9
- 10 1.21 FIELD MEASUREMENTS
11
12 A. The Contractor shall take all field measurements necessary for his work and shall assume the
13 full responsibility for their accuracy.
14
- 15 1.22 STRUCTURAL INTERFERENCES
16
17 A. Should any structural interferences prevent the installation of the outlets, running of conduits,
18 etc., at points shown on drawings, the necessary minor deviation therefrom, as determined by
19 the Architect, may be permitted. Minor changes in the position of the outlets or equipment if
20 decided upon before any work has been done by the Contractor shall be made without additional
21 charge.
22
- 23 1.23 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE
24
25 A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all
26 features of the building and site which may affect the execution of his work. No extra payment
27 will be allowed for the failure to obtain this information. If in the opinion of the Contractor
28 there are omissions or errors in the plans or specifications, the Contractor shall clarify these
29 points with the Architect before submitting his bid. In lieu of written clarification by addendum,
30 resolve all conflicts in favor of the greater quantity or better quality.
31
- 32 1.24 GUARANTEE
33
34 A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding
35 lamps, for a period of one year from the date of his final payment. He shall remedy any defects
36 in workmanship and repair or replace any faulty equipment which shall appear within the
37 guarantee period to the entire satisfaction of the Architect at no additional charge.
38
- 39 1.25 TEMPORARY WIRING AND SERVICE
40
41 A. Temporary electrical services include all electric service required up to the time of substantial
42 completion.
43
44 B. As soon as contract is awarded, Electrical Contractor will make all arrangements for temporary
45 service. A 120/240 volt, 200 ampere, single phase, 3 wire service shall be extended into the
46 building as work progresses and panels provided as necessary to provide a minimum of two
47 weatherproof sockets per 1000 sq. ft. of floor space. Sockets shall be utilized for interior
48 lighting and small fractional HP motors only. Cost of temporary service shall be by the
49 Electrical Contractor. In addition, install and maintain lamps as required to provide illumination
50 of ¼ watt per sq. ft. throughout, or as required by any codes or ordinances. Maintain and
51 replace all defective sockets, fuses and wiring. Remove temporary installation upon completion
52 of permanent service. All temporary wiring shall conform all applicable codes including NEC
53 and OSHA. Install permanent service as soon as practical.
54
55

- 1 C. All contractors shall provide and maintain their own extension cords and additional lamps as
2 required to perform his work properly. Contractors requiring temporary connections to 3 phase
3 power service and single phase feeders for other than lighting and small fractional horsepower
4 motorized tools shall make arrangement with the Electrical Contractor. Contractors requiring
5 lighting outside of the building shall make their own arrangements with the Electrical
6 Contractor and pay all costs for installation, maintenance and removal. Contractors requiring
7 electrical equipment over one HP, including welders, hoists, heaters and coolers shall make their
8 own arrangements for such service beyond the main switch and shall pay all costs thereof.
9
- 10 D. No permanent electrical equipment or wiring shall be used for temporary connections, unless
11 authorized by this Section, upon signed order and with approval by the Architect in behalf of the
12 Owner. Such approvals shall not shorten guarantee period.
13
- 14 E. Electrical energy to be paid for by owner.
15
- 16 1.26 ELECTRICAL SERVICE
17
- 18 A. Provide new electrical service at 208Y/120 volts.
19
- 20 B. Coordinate all aspects of the service with the electric utility and comply with their requirements.
21
- 22 C. Cost of service by Owner.
23
- 24 1.27 BRANCH CIRCUIT WIRING
25
- 26 A. See plans for general arrangement of circuits, conduit runs, and ratings of branch circuits and
27 special circuits.
28
- 29 B. Provide everything necessary to comply with the general scheme shown, including all types of
30 control.
31
- 32 C. Circuit numbers as shown on plans are for contractor to plan his wiring and for estimating
33 purposes. These numbers are not necessarily consecutive numbers of the panelboard breakers.
34 Balanced load on bus is to be the determining factor in arrangement of circuits. Balance loading
35 to within 7 1/2%.
36
- 37 D. Minimum size of lighting system branch circuit conductors to be #12 AWG.
38
- 39 E. Conductors terminating at wired outlets shall extend at least eight (8) inches beyond outlet box
40 conduit fitting.
41
- 42 F. 120 volt circuit home runs greater than 50 feet in length shall have #10 AWG minimum size
43 between panel and first receptacle or fixture outlet.
44
- 45 **G. The use of single-phase, multi-wire branch circuits with a common neutral is not**
46 **permitted. All branch circuits shall be furnished and installed with an individual**
47 **accompanying neutral, sized the same as the phase conductors.**
48
- 49 1.28 MOTOR WIRING
50
- 51 A. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall
52 be furnished by others.
53
- 54 B. Motors shall be set in place by others and the associated motor starters and controllers shall be
55 turned over to this Contractor for erection and line voltage power wiring.

- 1 C. Any contractor supplying starters and controllers that are not part of this contract shall index
2 same and provide this Contractor with instructions as to proper location in sufficient time to
3 permit the installation of a concealed raceway system.
4
- 5 D. Where this Contractor is required to provide control wiring, the Contractor supplying the
6 controllers shall provide all necessary and required wiring diagrams for proper installation.
7
- 8 E. Low voltage (less than 115 volts) control wiring shall be by others, unless noted elsewhere in
9 the specifications except that this Contractor shall extend circuit to associated transformers, wire
10 and connect to same.
11
- 12 F. This Contractor shall examine the plans and specifications of other sections and shall include in
13 his bid all control wiring, as referenced to be performed by Section 16001.
14
- 15 G. Required disconnect switches furnished by other sections shall be installed by Section 16001.
16 Furthermore, this Contractor shall provide all disconnect switches required by code that are not
17 furnished by other sections.
18
- 19 1.29 SPECIAL OUTLETS
20
- 21 A. General: Furnish and install outlets, wiring and receptacles accordingly, at locations required by
22 equipment serviced or otherwise as directed. Extend wiring to outlets on equipment and make
23 final connection.
24
- 25 1.30 IDENTIFICATION
26
- 27 A. General:
28 1. Materials and equipment installed under this Section shall be clearly identified as listed
29 below.
30 2. Locate identification conspicuously.
31 3. Terminology to be approved by Architect.
32 4. See plans for any additional items to be identified.
33 5. Loads such as motors shall be described by function rather than by the system of arbitrary
34 number as shown on electrical plans.
35 6. Use abbreviations sparingly.
36
- 37 B. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely screwed or riveted to
38 the following equipment. Size 1" x 4" with 3/8" high letters; unless space available dictates
39 differently.
40 1. Each panelboard, contactor, time switch, starter or disconnect switch. Locate on inside
41 cover of panels.
42 2. Each feeder at all accessible locations.
43 3. Each end of empty conduit runs to indicate the intended use of the conduit and the
44 location of opposite end. Use room numbers that are permanently assigned.
45
- 46 C. Typewritten Directory: Each panelboard both new and existing shall be provided with a
47 typewritten directory attached to the inside of panel door and covered with clear plastic
48 indicating load served and rooms served by each protective device in the respective panel.
49 Spares and spaces shall be clearly identified.
50
- 51 D. Switch Station:
52 1. All key switches shall be engraved indicating controlled item.
53 2. All remote switches shall be engraved indicating controlled item.
54
55

1 E. Conductor Identification:

- 2 1. Identify each conductor at each wiring device, connector or splice point with permanently
3 attached wrap-around adhesive markers as manufactured by Brady Co. or 3M.
4 2. This identification shall include branch circuit number, control circuit, or any other
5 appropriate number or lettering that will expedite future tracing and trouble shooting.
6

7 1.31 LOCATIONS OF OUTLETS AND WIRING DEVICES
8

9 A. Outlets:

- 10 1. Locations of outlets and electrical equipment on the drawings are approximate only.
11 Unless otherwise indicated on the drawings or established in the specifications, the exact
12 locations of electrical outlets shall be established in the field by directive from the
13 Architect. Generally, outlets shall be located as required for proper installation of
14 equipment served and otherwise locations shall be established by construction or code
15 requirements and such as to be coordinated with equipment of other trades.
16 2. This Section shall consult with the Architect and refer to all details, sections, elevations
17 and equipment plans and the plans of other trades for exact location.
18 3. The Architect reserves the right to make reasonable changes in the location of outlets,
19 apparatus or equipment up to the time of roughing in. Such changes as directed shall be
20 made by the Contractor without additional compensation.
21 4. Dimensions taken by scale shall not be used to establish rough-in locations.
22

23 B. Wiring Devices:

- 24 1. The approximate location of wiring devices are indicated on the drawings; the specific
25 location shall be determined in accordance with "Location of Outlets" of these
26 specifications and as follows.
27 2. This Section is referred to equipment plans, equipment shop drawings, elevation
28 drawings and other detail or dimensional drawings, and he shall consult with the
29 Architect before installation of proceeding with any work dependent upon this
30 information.
31 3. Generally, wiring devices shall be located as follows:
32 a. Wall receptacles shall generally be centered 15" above the finished floor and
33 6" above surface of built-in counters and tables where same abuts wall and 4"
34 above backsplashes if counters are so equipped.
35 b. Special purpose receptacles shall be located as required by equipment served.
36 c. Switches shall be centered 48" above finished floor on latch side of door
37 opening with edge of plate not more than 12" from door frame, except as noted
38 on the drawings.
39 d. In hazardous areas, the location of wiring devices shall be established by Code
40 requirements which shall take precedence over conflicting information on the
41 drawings or included herein.
42

43 1.32 TELEPHONE SYSTEM
44

45 A. Refer to the electrical specification section 27 10 00 – Telecommunication Distribution System
46 for detailed information on the telephone system.
47

48 B. The owner will be using a VOIP (voice over internet protocol) telephone system so all telephone
49 cabling will be using same cabling used for data.
50

51 C. Telephone instruments, switching equipment, and other accessories shall be furnished and
52 installed by the Owner.
53

54 D. This Contractor shall supply all required cabling, jacks, conduit, sleeves, and service fittings for
55 the telephone system.

- 1 E. All conduits shall be complete with fish wire by this Contractor, and all telephone outlets shall
2 be fed by a minimum 1" conduit.
3
- 4 F. All telephone boxes shall be two gang boxes with one gang plaster cover.
5
- 6 G. Verify all phone locations with the Architect in the field.
7
- 8 1.33 DEMOLITION, RENOVATION AND DISPOSITION OF EXISTING EQUIPMENT
9
- 10 A. This Contractor shall remove all electrical equipment and no equipment removed shall be
11 reused. All electrical equipment removed during construction shall become the Contractor's
12 property and shall be removed from the site.
13
- 14 B. All coring that is required for electrical work shall be by this Contractor.
15
- 16 C. All new conduit and wiring shall be concealed where possible to do so without extensive cutting
17 and patching. All exposed work shall be run in wiremold and installed only where approved by
18 Architect. Routing shall be subject to Architects approval. Make use of all standard wiremold
19 colors to match surfaces as closely as possible.
20
- 21 D. All ballasts and lamps removed during the project, become the Contractor's property and he
22 shall dispose of them in accordance with applicable DNR and EPA regulations.
23
- 24 1.34 SEALING AND FIREPROOFING
25
- 26 A. Sealing and fireproofing of openings between conduit, cable tray, wireway, trough, cablebus,
27 busduct, etc. and fire rated surfaces shall be the responsibility of the contractor whose work
28 penetrates the opening.
29
- 30 B. Sealing and fireproofing shall use materials and methods complying with ASTM E814
31 requirements appropriate to the rating of the material penetrated.
32
- 33 C. Materials by Dow-Corning, 3M, Specified Technologies, Inc., and Chase-Foam are acceptable
34 if in accordance with (B) above.
35
- 36 D. Submit manufacturer's penetration details to authority having jurisdiction. Details shall confirm
37 method's compliance with ASTM E814.
38
- 39 E. Include copies of penetration details in Project Operation and Maintenance Manuals.
40
- 41 1.35 ALTERNATE BIDS
42
- 43 A. See Section 01030 for descriptions of alternates required.
44
- 45
- END OF SECTION 26 05 00

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SECTION 26 09 23

OCCUPANCY SENSOR LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 GENERAL PROVISIONS

- A. In general, the work includes:

1. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
2. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.
3. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.

1.03 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years.
- B. All components shall be UL listed, offer a five (5) year warranty and meet all state and local applicable codes requirements.

1.04 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the owner, all or in parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.05 SUBMITTALS

- A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data, and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

1 B. Submit a lighting plan clearly marked by manufacturer showing proper product, location, and
2 orientation of each sensor.

3
4 C. Submit any interconnection diagrams per major sub-system showing proper wiring.

5
6 D. Submit standard catalog literature which includes performance specifications indicating
7 compliance to the specification.

8
9 1.06 SYSTEM OPERATION

10
11 A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's
12 satisfaction with the occupancy system.

13
14 PART 2 - PRODUCTS

15
16 2.01 ACCEPTABLE MANUFACTURERS

17
18 A. The Watt Stopper, Inc.

19
20 B. Or Equivalent Devices by the Following Manufacturers

21 1. Hubbell

22 2. Leviton

23 3. Sensor Switch

24
25 2.02 SYSTEM OPERATION

26
27 A. All products shall be Watt Stopper product numbers:

28 1. Ceiling Sensors: DT-355 Dual Technology, line voltage.

29
30 B. Passive Infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier
31 configuration, with grooves-in to eliminate dust and residue build-up.

32
33 C. Passive Infrared and Dual Technology sensors shall have fully automatic operation, offer
34 daylighting footcandle adjustment control and be able to accommodate dual level lighting.

35
36 D. All sensors shall be capable of operating normally with electronic ballast, PL lamp systems, and
37 rated motor loads.

38
39 E. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic
40 reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

41
42 F. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity.
43 Controls shall be recessed to limit tampering.

44
45 G. In the event of failure, a bypass manual override shall be provided on each sensor. When
46 bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch
47 until sensor is replaced. This control shall be recessed to prevent tampering.

48
49 H. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005%
50 tolerance to assure reliable performance and eliminate sensor cross talk. Sensors using multiple
51 frequencies are not acceptable.

52
53 I. All sensors shall provide a method of indication to verify that motion is being detected during
54 testing and that the unit is working.

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- J. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.
- K. The Contractor shall certify in writing that installed sensors comply with the specified California Energy Commission criteria for ultrasonic sound.
- L. All sensors shall have UL rated, 94V-0 plastic enclosures.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. It shall be the contractor's responsibility with the suppliers assistance to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within in the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.
- B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.
- C. Proper judgement must be exercised in executing the installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

END OF SECTION 26 09 23

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SECTION 26 20 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 REFERENCES

- A. National Electrical Manufacturer's Association (NEMA).
B. Underwriters Laboratories, Inc. (UL).
C. American Society for Testing and Materials (ASTM).
D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

A. Product Data

1. Submit for disconnects, motor starters, panelboards, circuit breakers, overcurrent protective devices, transformers, and mini-power centers.
2. Product data sheets with printed installation instructions.

B. Shop Drawings:

1. Submit for motor starters.
2. Show enclosure dimensions, nameplate nomenclature, electrical ratings, and thermal unit schedule.
3. Wiring diagrams and schematics.

C. Approval of equipment supplied in this section is contingent upon Contractor verification of available fault current from electric utility.

1. Notify ENGINEER if available fault current is higher than specified equipment.

D. Operation and Maintenance (O&M) Data:

1. Maintenance data for materials and products for inclusion in Operating and Maintenance Manual.

E. Test Results:

1. Report of field tests and observations certified by Contractor.

1.04 QUALITY ASSURANCE

A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

B. Regulatory Requirements:

1. National Electrical Code: Components and installation shall comply with NFPA 70.
2. Local codes and ordinances.

1 PART 2 - PRODUCTS

2
3 2.01 ELECTRICAL METALLIC TUBING (EMT)
4 INTERMEDIATE METALLIC CONDUIT (IMC)
5 GALVANIZED RIGID STEEL CONDUITS (GRS)

6
7 A. Manufacturers:

- 8 1. Allied Steel
9 2. Omega
10 3. Wheatland
11 4. Columbia

12
13 B. Manufacturer's standard lengths and size.

14
15 C. Protected inside and out by hot-dipped galvanized or electrogalvanized coating.

16
17 D. Minimum size: 1/2 inch.

18
19 E. Do not use aluminum conduit.

20
21 2.02 MC CABLE (ALLOWED UNDER ALTERNATE BID)

22
23 A. Provide metal-clad cable (Type MC) that complies with UL Standard 1569, the NEC, and this
24 Section.

25
26 B. Metal-clad cable manufacturer: AFC Cable Systems Inc.

27
28 C. Provide NRTL listed, insulated throat, snap-in steel box connectors for Type MC cables.
29 Manufacturer: O-Z/Gedney ETP "Speed-Lock".
30

31 2.03 PLASTIC CONDUIT (PVC)

32
33 A. Manufacturers:

- 34 1. Carlon.
35 2. Genova.
36 3. Certainteed.

37
38 B. Standard lengths and sizes.

39
40 C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC2
41 standards, UL listed, and as required by NEC.
42

43 D. Rated for 90 degree Centigrade cable.

44
45 E. Minimum size: 1" inch.

46
47 2.04 FLEXIBLE CONDUIT

48
49 A. Manufacturers:

- 50 1. Triangle PWC, Inc.
51 2. Anaconda
52 3. Flexsteel
53 4. American Flexible Conduit

54
55 B. Galvanized flexible steel.

- 1 C. Standard conduit sizes.
- 2
- 3 D. Minimum Size: 1/2 inch.
- 4
- 5 2.05 LIQUIDTIGHT FLEXIBLE CONDUIT
- 6
- 7 A. Manufacturers:
- 8 1. O-Z/Gedney Company
- 9 2. American Flexible Conduit
- 10 3. Flex-Guard, Inc.
- 11 4. Liquatite
- 12 5. Anaconda
- 13
- 14 B. Galvanized flexible steel.
- 15
- 16 C. Standard conduit sizes.
- 17
- 18 D. Minimum Size: 1/2 inch.
- 19
- 20 E. Heavy wall PVC jacket.
- 21
- 22 2.06 FITTINGS
- 23
- 24 A. Manufacturers:
- 25 1. Appleton Electric Company.
- 26 2. Steel City, American Electric.
- 27 3. Oz-Gedney Co.
- 28
- 29 B. Steel or malleable iron, zinc galvanized or cadmium plated.
- 30
- 31 C. Do not use indentor type fittings.
- 32
- 33 D. Do not use aluminum or die cast fitting.
- 34
- 35 E. EMT IMC and GRS Connectors and Couplings:
- 36 1. Threaded.
- 37 2. Gland compression type, or set screw.
- 38 3. Insulated throat.
- 39 4. Rain and concrete type.
- 40
- 41 F. Flexible Conduit Connectors and Couplings:
- 42 1. Threaded.
- 43 2. Insulated throat.
- 44 3. Grounding type.
- 45 4. Gland compression type, or set screw.
- 46
- 47 G. Liquidtight Flexible Conduit Fittings:
- 48 1. Liquidtight.
- 49 2. Insulated throat.
- 50 3. Threaded.
- 51 4. Gland compression type, or set screw.
- 52 5. Grounding type.
- 53

- 1
2 H. Expansion Joints:
3 1. Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type
4 XJ.
5 2. Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type
6 XD.
7
8 I. Seals:
9 1. Wall entrance, Appleton Type FSK or FSC.
10
11 J. Drain Fittings:
12 1. Automatic Drain Breather:
13 a. Explosionproof.
14 i. Safe for Class I, Groups C and D.
15 b. Capable of passing minimum 25 cc water/minimum and minimum 0.05 cubic
16 foot air/minimum at atmospheric pressure.
17 2. Condensate Drain:
18 a. Conduit outlet body, Type T.
19 b. Threaded, galvanized plug with 3/16 inch drilled holed through plug.
20
21 2.07 SURFACE METAL RACEWAY
22
23 A. Manufacturers:
24 1. Wiremold Co.
25 2. Hubbell Co.
26 3. Steel City, American Electric
27
28 B. General:
29 1. Wiremold Series 700 series or equal.
30 2. Base and cover section to accommodate pulling conductors through raceway.
31 3. capable of being over painted.
32 4. Full complement of fitting must be available.
33
34 C. The use of surface raceways shall be minimized on the project. Surface raceway shall only be
35 used where installing new devices on existing walls that are not being furred out or where
36 conduit cannot be installed in an existing wall
37
38 D. Any use of surface raceway shall be approved by the Architect prior to installation.
39
40 2.08 WIRES, CABLES, AND CONNECTORS
41
42 A. Manufacturers:
43 1. Wire and Cable:
44 a. Continental
45 b. Southwire.
46 c. Rome Cable.
47 d. Houston Wire and Cable.
48 e. Beldon.
49 f. Dekoron.
50 g. Royal
51 h. South
52 i. General
53 2. Connectors:
54 a. Burndy.
55 b. Thomas and Betts.

- 1 c. Blackburn, American Electric.
2 3. Electrical Tape:
3 a. 3M Scotch Brand.
4 b. Plymouth.
5 c. or equal.
6
7 B. Copper wire only.
8
9 C. 600 v insulation (ASTM standard compounds) and color code conductors for low voltage
10 (secondary feeders and branch circuits) as required by NEC.
11 1. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for branch circuit
12 and feeder conductors size No. 8 AWG and smaller.
13 2. Type XHHW-2 Stranded: Single conductor for branch circuits, feeders and service
14 conductors larger than No. 8 AWG.
15 3. Provide grounding conductor with same insulation as circuit conductors when run with
16 circuit conductors.
17 4. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for 120 v control
18 wiring and No. 14 AWG minimum for graphic indication, nonshielded instrumentation
19 and other control wiring operating at less than 120 v unless otherwise noted on Drawings.
20 a. Provide high density polyethylene jacketed multi-wire cable assemblies in
21 underground conduit or duct.
22
23 D. Joints, Taps, and Splices:
24 1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed
25 compression spring-type solderless connectors with plastic cover.
26 2. Joints, Taps, and Splices in Conductors No. 8 AWG and Larger: Solderless two or four-
27 bolt compression type connectors of type that will not loosen under vibration or normal
28 strains.
29 3. Terminations: Compression-type crimp lugs.
30
31 2.09 BOXES
32
33 A. Manufacturer:
34 1. Interior Outlet Boxes:
35 a. Appleton Electric Company.
36 b. Raco.
37 c. Steel City, American Electric.
38 2. Weatherproof Outlet Boxes:
39 a. Appleton Electric Company.
40 b. Crouse-Hinds Company.
41 c. O-Z/Gedney company.
42 d. Perfect-Line, American Electric.
43 3. Junction and Pull Boxes:
44 a. Hoffman Engineering Company.
45 b. Keystone Columbia, Inc.
46 c. Electromate.
47
48 B. Outlet Boxes - Flush Mounted:
49 1. Wall Outlets: Square corner, galvanized masonry type with internally mounted ears or 4-
50 inches square with raised cover having square corners and internally mounted ears.
51 2. Ceiling Lighting Fixture Outlet Boxes: 4-inch square galvanized box with raised cover
52 set flush with finished surface, complete with 3/8 inch fixture stud.
53
54 C. Outlet Boxes - Surface Mounted:
55 1. General Use: 4-inches square with raised device cover.

-
- 1 2. Weatherproof: Cast galvanized with threaded hub.
2 3. Safety outlet enclosure - Tay Mac Co. - Verify outlet configuration.
3 4. Hazardous Locations: Cast galvanized approved for classification of area.
4
5 D. Junction and Pull Boxes:
6 1. Fabricate from code gauge galvanized steel, with covers held in-place by corrosion
7 resistant machine screws.
8 2. Size as required by code for number of conduits and conductors entering and leaving box.
9 3. Provide with welded seams where applicable, and equipment with corrosion resistant
10 nuts, bolts, screws, and washers.
11 4. Finish with rust inhibiting primer.
12
13 2.10 WIRING DEVICES
14
15 A. Manufacturers:
16 1. Hubbell Wiring Device Division.
17 2. Pass and Seymour, Inc.
18
19 B. Fabricated Devices:
20 1. Factory-fabricated, specification grade wiring devices in type, color, and electrical rating
21 for service indicated. Ivory color or as selected by ENGINEER OR OWNER.
22 2. Wiring devices of one manufacturer.
23 3. See Drawing symbol schedule for identification of device type.
24
25 C. Switches:
26 1. General Use Lighting Switches: 20 amp toggle, equal to Hubbell No. 1221-I series.
27 2. Switches controlling equipment, operation of which is not evident from switch position,
28 shall include flush neon pilot light in conjunction with proper switch. Each switch shall
29 be complete with engraved plate to identify equipment being controlled (white letters on
30 black, 1/8 inch high minimum).
31
32 D. Receptacles:
33 1. General use duplex receptacles: NEMA No. 5-20R, grounding type, 20 amp Hubbell No.
34 5362 Specification Grade.
35 2. Special purpose receptacles as shown on Drawings and schedules.
36 3. GFI receptacles shall be Hubbell GFR5352IA
37
38 E. Wiring Device Plates and Covers:
39 1. Wall plates for wiring devices with ganging and cut-outs as indicated, provided with
40 metal screws for securing plates to devices, screw heads colored to match finish of plate.
41 2. Plates for Flush Mounted Devices: Smooth thermoset plastic, color per Architect.
42 3. Telephone outlet configuration to match telephone outlet jack or cable.
43 4. Device plates for surface mounted Type FS or FD boxes to be Type FSK galvanized
44 steel.
45 5. Device plates for surface mounted, 4-inch square bossed to be ½ inch raised galvanized
46 steel covers.
47 6. Weatherproof outlet enclosure for exterior devices or devices in damp locations to be
48 marked galvanized gray cast malleable with gasketed lift cover plate as shown on
49 Drawings. Suitable for wet locations while in use. Enclosure must be gasketed. Provide
50 Intermatic WP1010MC, WP1010HMC, or WP1030MC with appropriate mounting
51 base(s) and inserts.
52
53 2.11 MOTOR AND CIRCUIT DISCONNECTS
54
55 A. Manufacturers:

- 1 1. Eaton/Cutler-Hammer
- 2 2. Siemens
- 3 3. Square D
- 4 4. Allen Bradley
- 5 5. General Electric
- 6
- 7 B. Enclosed Circuit Breaker Construction:
- 8 1. Dual cover interlock.
- 9 2. External trip indication.
- 10 3. Provisions for control circuit interlock.
- 11 4. Padlock provisions for padlock in Off position.
- 12 5. Handle attached to box, not cover.
- 13 6. Handle position indicates On, Off or Tripped.
- 14 7. Provisions for insulated or groundable neutral.
- 15
- 16 C. Safety Switches:
- 17 1. NEMA heavy duty Type HD.
- 18 2. Dual cover interlock.
- 19 3. Visible blades.
- 20 4. Provisions for control circuit interlock.
- 21 5. Pin type hinges.
- 22 6. Tin plated current carrying parts.
- 23 7. Quick make and break operator mechanism.
- 24 8. Handle attached to box, not cover.
- 25 9. Handle position indication, On in up position and Off in down position.
- 26 10. Padlock provisions for up to 3 padlocks in Off position.
- 27 11. UL listed lugs for type and size of wire specified.
- 28 12. Spring reinforced fuse clips for Class R fuses.
- 29 13. Provisions for insulated or groundable neutral.
- 30 14. UL listed short circuit rating 200,000 RMS amp with Class R fuses.
- 31
- 32 D. Enclosures:
- 33 1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
- 34 2. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish.
- 35
- 36 2.12 FUSES
- 37
- 38 A. Manufacturers:
- 39 1. Bussmann
- 40 2. Gould Shawmut
- 41 3. Littlefuse
- 42 4. Brush
- 43
- 44 B. 250 v. Fuses:
- 45 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 46 interrupting rating.
- 47 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit
- 48 protection for motor, transformer, welder, feeder, and main service protection.
- 49
- 50 C. 600v Fuses:
- 51 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 52 interrupting rating.
- 53 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit
- 54 protection for motor, transformer, welder, feeder and main service protection.
- 55 2. Class L, bolt-in 601 to 6,000 amps, 200,000-amp interrupting rating.

-
- 1 a. Gould Shawmut A48Y, time delay for overload and short circuit protection for
2 motor, transformer, feeder, and main service protection.
3 3. Class CC, fast acting, single element, 1/10 to 30 amps, 200,000-amp interrupting rating.
4 a. Gould Shawmut ATDR, UL listed for motor control circuits, lighting ballasts,
5 control transformers, and street lighting fixtures.
6
7 D. Spare Fuses:
8 1. 10%, minimum of 3, of each type and rating of installed fuses.
9
10 2.13 PANELBOARDS
11
12 A. Manufacturers:
13 1. Square D only or Siemens.
14
15 B. Panelboard Ratings:
16 1. UL listed short circuit rating (integral equipment rating):
17 a. Up to 240 v: 10,000 RMS symmetrical amp minimum.
18 b. Up to 480 v. 14,000 RMS symmetrical amp minimum.
19 c. As shown on Drawings.
20
21 C. Panelboard Construction:
22 1. Main breaker or main lugs only, per panelboard schedule.
23 2. Molded case circuit breakers.
24 3. Terminals:
25 a. UL listed for type or wire specified.
26 b. Anti-turn solderless compression type.
27 4. Bussing:
28 a. Distributed phase sequence type.
29 b. 225 amps, 98% conductivity hard drawn copper or as shown on panelboard
30 schedule or Drawings.
31 c. Copper.
32 d. Mounting hardware behind usable space.
33 5. Gutters adequate for wire size used, 4-inch minimum.
34 6. Boxes:
35 a. Code gauge galvanized steel.
36 b. Without knockouts.
37 7. Fronts:
38 a. Panel front cover shall have piano hinge to allow access to wiring gutters
39 without removal of panel trim. Hinged trim held in place with screw fasteners.
40 Door shall be built into trim, which allows access to breakers as well as to
41 hinged trim screw fasteners. Breaker access door shall have the following
42 features:
43 i. Concealed piano hinge.
44 ii. Flush stainless steel cylinder tumbler type locks with spring loaded
45 door pulls.
46 iii. Locks keyed alike.
47 iv. Rust inhibiting primer, baked enamel finish.
48 v. Dead front safety type.
49 vi. Concealed hinges and trim clamps..
50 vii. Circuit Directory:
51 viii. Suitable for complete descriptions.
52 ix. Clear plastic cover.
53 8. Typewritten card inside panel door.
54 9. Special features as shown on Drawings.
55 10. Code gauge steel.

- 1 11. Engraved laminated nameplate in accordance with Section 26 05 00.
2
3 D. Manufacturers:
4 1. Square D or Siemens.
5
6 E. Permanent Trip Circuit Breakers:
7 1. Lighting Panel Circuit Breakers:
8 a. Thermal and magnetic protection.
9 b. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
10 c. Bolt-on type unless otherwise noted on Drawings.
11 d. Quick make and break toggle action.
12 e. Handle trip indication.
13 f. Handle position indication, On, Off, and Tripped centered.
14 g. UL listed for type of wire specified.
15 h. UL listed short circuit rating (integrated equipment rating).
16 i. Up to 240 v: 10,000 RMS symmetrical amp minimum.
17 ii. Up to 480 v: 14,000 RMS symmetrical amp minimum.
18 i. UL SWDL switching duty on 120 v. circuits for switched circuits.
19 j. Switch neutral common trip per NEC 514-5 for fuel pumps.
20 2. Power Panel Circuit Breakers:
21 a. Thermal and magnetic protection.
22 b. Magnetic protection only in combination with motor starters and motor circuit
23 protectors (MCP).
24 c. Single magnetic trip adjustment.
25 d. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
26 e. Push-to-trip test button.
27 f. Bolt-on type.
28 g. Quick make and break toggle action.
29 h. Handle trip indication.
30 i. Handle position indication, On, Off, and Tripped centered.
31 j. UL listed for type of wire specified.
32 k. UL listed short circuit rating (integrated equipment rating).
33 i. Up to 240 v: 10,000 RMS symmetrical amp minimum.
34 ii. Up to 480 v: 14,000 RMS symmetrical amp minimum.
35
36 2.14 GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLES (GFCI)
37
38 A. Ratings:
39 1. 120 vac.
40 2. 20 amp.
41
42 B. Tripping Requirement:
43 1. UL Class A.
44
45 C. Construction:
46 1. Shallow depth.
47 2. Line and load terminal screws.
48 3. Noise suppression.
49 4. Feed through.
50 5. Standard duplex wall plates shall fit.
51 6. NEMA 5-20R configuration.
52
53 D. Meet requirements of UL 943 ground-fault circuit interrupters.
54

- 1
2 2.15 GROUNDING AND BONDING
3
4 A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes,
5 ratings, and quantities indicated are in excess of NEC requirements, more stringent requirements
6 and greater size, rating, and quantity indications govern.
7 B. Conductor Materials: Copper.
8
9 C. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including
10 stranding.
11
12 D. Equipment Grounding Conductor: Green insulated.
13
14 E. Grounding Electrode Conductor: Stranded cable.
15
16 F. Bare Copper Conductors:
17 1. Solid Conductors: ASTM B3.
18 2. Assembly of Stranded Conductors: ASTM B8.
19 3. Tinned Conductors: ASTM B33.
20
21 G. Ground Bus: Bar annealed copper bars of rectangular cross section.
22
23 H. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bar copper wire, terminated with
24 copper ferules.
25
26 I. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except
27 as indicated.
28
29 J. Connector Products
30 1. General: Listed and labeled as grounding connectors for materials used.
31 2. Pressure Connectors: High-conductivity-plated units.
32 3. Bolted Clamps: Heavy-duty units listed for application.
33 4. Exothermic Welded Connections: Provide in kit form and select for specific types, sizes,
34 and combinations of conductors and other items to be connected.
35
36 PART 3 - EXECUTION
37
38 3.01 GENERAL
39
40 A. Install products in accordance with NEC, manufacturer's instructions, applicable standards, and
41 recognized industry practices to ensure products serve intended function.
42
43 3.02 CONDUITS AND CONDUIT FITTINGS
44
45 A. Complete conduit installation prior to installing cables.
46
47 B. Unless specifically indicated otherwise on Drawings, use rigid galvanized steel conduit for
48 general wiring.
49
50 C. Provide watertight conduit system where installed in wet places, underground or where buried
51 in masonry or concrete.
52
53 D. EMT conduit may be used for conduit sizes up to 4 inches.
54
55

- 1 E. Conduit shall be run concealed except exposed surface conduit may be installed where noted on
2 Drawings or where concealment found to be impractical or impossible, and only with approval
3 of ENGINEER.
4
- 5 F. Continuous from outlet to outlet and from outlets to cabinets, junction or pull boxes.
6
- 7 G. Enter and secure to boxes ensuring electrical continuity from point of service to outlets.
8
- 9 H. Conduit runs extending through areas of different temperature or atmospheric conditions or
10 partly indoors and partly outdoors shall be sealed, drained, and installed in manner preventing
11 drainage of condensed or entrapped moisture into cabinets, motors or equipment enclosures.
12
- 13 I. Run conduits within concrete structures parallel to each other and spaced on center of at least
14 three times conduit trade diameter with minimum 2-inch concrete covering. Conduits over 1
15 inch may not be installed in slab without approval of ENGINEER.
16
- 17 J. Run exposed conduits parallel to or at right angles with lines of building.
18
- 19 K. Route conduit runs above suspended acoustical ceilings not interfering with tile panel removals.
20
- 21 L. Secure conduit in-place with not less than 1 malleable corrosionproof alloy strap or hanger per 8
22 feet of conduit.
23 1. Do not use perforated strapping.
24
- 25 M. Connections to Motors and Equipment Subject to Vibration:
26 1. Flexible steel conduit not over 3 feet long or where exposed in mechanical and utility
27 areas and not subjected to moisture, dirt, and fumes.
28 2. Liquidtight flexible conduit not over 3 feet long where exposed in finished areas or where
29 subject to moisture, dirt, fumes, oil, corrosive atmosphere, exposed or concealed, with
30 connectors to ensure liquidtight, permanently grounded connection. Locate where least
31 subject to physical abuse.
32
- 33 N. Use double lock nuts and insulated bushings with threads fully engaged.
34
- 35 O. Connectors at fixture bodies and boxes shall be rigidly secured with galvanized lock nut and
36 bushing.
37
- 38 P. Cap conduits after installation to prevent entry of debris.
39
- 40 Q. Install conduit expansion fittings complete with bonding jumper in following locations.
41 1. Conduit runs crossing structural expansion joint.
42 2. Conduit runs attached to two separate structures.
43 3. Conduit runs where movement perpendicular to axis of conduit may be encountered.
44
- 45 R. Install 4 feet-0 inch to 6 feet-0 inch flexible steel conduit drops from independent junction box
46 mounted above ceiling and accessible from below ceiling to recessed ceiling mounted
47 equipment. Allow for positioning of equipment to tile increments.
48
- 49 S. Negotiate beams and changes in ceiling heights with LB conduit fittings on outside corners and
50 ells on inside corners. Arrange bends and offsets in parallel conduits to present neat
51 symmetrical appearance.
52
- 53 T. In precast areas, run conduits in insulation space or in floor topping without crossing conduits,
54 using 3/4 in. maximum conduit size.
55

-
- 1 U. Core drill through reinforced concrete with approval of ENGINEER.
2
3 V. Split, crushed or scarred conduit not acceptable.
4
5 W. Do not route over boiler, incinerator or other high temperature equipment.
6
7 X. Flexible metal conduit can only be used for final connections to motors, transformers, or to light
8 fixtures above suspended ceilings.
9
- 10 3.03 MC CABLE (ALLOWED UNDER ALTERNATE BID)
- 11
12 A. Provide minimum 12 AWG conductors in Type MC cables.
13 1. Provide larger conductor sizes as required to limit branch circuit voltage drop to 3 percent
14 at the full connected load.
15 2. Provide Type MC cables with a separate neutral conductor for each phase conductor.
16 Multi-wire circuits are not permitted.
17
18 B. Provide MC cables with the same conductor color coding as specified for BUILDING WIRE.
19
20 C. Install MC cables according to NECA 120, "Standard for Installing and Maintaining Armored
21 Cable (Type AC) and Metal-Clad Cable (Type MC)" (ANSI), the NEC, and requirements in this
22 Section.
23
24 D. Use Type MC cables only for 20-ampere branch circuit wiring beyond the first outlet or junction
25 box. Use conduit for the "homerun" from the first outlet or junction box to the branch circuit
26 panelboard.
27
28 E. Use Type MC cables in interior, dry locations where they will be concealed above ceilings, in
29 dry-wall partitions, in equipment enclosures, or below raised floors. Type MC cables may be
30 installed exposed in dedicated electrical rooms and mechanical rooms if they will not be
31 exposed to physical damage or deteriorating agents.
32
33 F. Where metal clad cables are exposed, run parallel with walls or structural elements. Vertical
34 runs shall be plumb; horizontal runs level and parallel with structure, as appropriate. Groups
35 shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.
36 G. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with
37 suitable clamps or fasteners of approved type, and vertical conduits shall be properly supported
38 to present a mechanically rigid and secure installation.
39
40 H. Metal clad cable installed parallel to framing members, such as studs, joist, or rafters, shall be
41 supported so that the nearest outside surface of the cable is not less than 1-1/4 inches (31 mm)
42 from the nearest edge of the framing member. Where this distance cannot be maintained, the
43 cable shall be protected by a steel plate, sleeve, or equivalent that is at least 1/16-inch thick.
44
45 I. Maintain at least 6 inch clearance between metal clad cables and other piping systems.
46 Maintain 12 inch (300 mm) clearance between metal clad cables and heat sources such as flues,
47 steam pipes, and heating appliances.
48
49 J. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the
50 ready removal of other pipes or ducts for repairs.
51
52

- 1 K. Individual metal clad cables hung from roof structure or structural ceiling shall be supported by
2 split-ring hangers and wrought-iron hanger rods. Where 3 or more metal clad cables are
3 suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung
4 from 1/2-inch (13 mm) rods to support the conduits. The conduit on these channels shall be
5 held in place with metal clad cable clamps designed for the particular channel that is used.
6
7 L. Secure metal clad cable support racks to concrete walls and ceilings by means of cast-in-place
8 anchors; die-cast, rustproof alloy expansion shields; or cast flush anchors. Wooden plugs,
9 plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit
10 supports.
11
12 M. Metal clad cable shall be supported immediately on each side of a bend and not more than 1 foot
13 (300 mm) from an enclosure where a run of metal clad cable ends.

14
15 3.04 SURFACE METAL RACEWAY

- 16
17 A. Mount to surface with No. 8 flathead fasteners or approved support clips.
18
19 B. Do not pinch wires.
20
21 C. Remove metal burrs and sharp edges.
22
23 D. Provide bushing.
24
25 E. Install in accordance with manufacturer's recommendations.
26
27 F. Provide covers where two lengths come together.
28

29 3.05 WIRE AND CABLE

- 30
31 A. Run wire and cable in conduit unless otherwise indicated on Drawings.
32
33 B. On branch circuits, use standard colors.
34
35 C. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with 2 half-lap
36 layers of vinyl plastic electrical tape and finish wrap of color coding tape, where required by
37 code.
38
39 D. Run ground wire with power circuits; conduit shall not be grounding path.
40
41 E. Color Coding: Conductors for lighting and power wiring as indicated below.
42

<u>Phase</u>	<u>208/120v</u>	<u>480/277v</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

43
44
45
46
47
48

49 3.06 BOXES

- 50
51 A. Install knockout closures to cap unused knockout holes where blanks have been removed.
52
53 B. Locate boxes to ensure accessibility of electrical wiring.
54
55

-
- 1 C. Secure boxes rigidly to subsurface upon which being mounted or solidly embed boxes in
2 concrete or masonry. Do not support from conduit.
3
- 4 D. Do not burn holes, use knockout punches or saw.
5
- 6 E. Provide outlet box accessories as required for each installation such as mounting brackets,
7 fixture study, cable clamps, and metal straps for supporting outlet boxes compatible with outlet
8 boxes being used and meeting requirements of individual wiring situations.
9
- 10 F. Location of outlets and equipment shown on Drawings is approximate. Verify exact location.
11
- 12 G. Minor modification in location of outlets and equipment is considered incidental up to distance
13 of 10 feet with no additional compensation, provided notification of modification is given prior
14 to roughing in of outlet.
15
- 16 H. Flush outlets shall have edges or plaster flush with finished wall or ceiling surfaces so plates can
17 be drawn tightly to wall or ceiling surfaces.
18
- 19 I. Mounting heights:
20 1. Shall conform to ADA guidelines.
21 2. In general, unless otherwise shown on Drawings:
22 a. Switches: 48 inches above floor to top of box.
23 b. AC Receptacles and Telephone Outlets: 15 inches above floor to bottom of
24 box or 6 inches above counters, counter backsplashes in finished areas; 48
25 inches to top of box above floor in unfinished areas.
26 c. Wall Bracket Lighting Fixtures: 8 inches above mirrors or 6 feet-6 inches
27 above floor.
28 d. Pushbuttons: 48 inches above floor to top of box.
29 e. Motor Starters and Disconnect Switches: 60 inches above floor.
30 i. Thermostats: 48 inches above floor.
31 f. Bells and Horns: 8 feet-0 inches above floor.
32 g. Clocks: 8 ft.-0 inches above floor.
33 h. Fire Alarm visual signals 80" above floor.
34 i. Emergency Battery Units: 8 ft. - 0 inches above floor or 12" below ceiling.
35
- 36 J. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall,
37 minimum 12 inches.
38
- 39 K. Where emergency switches occur adjacent to normal light switches, install in separate boxes in
40 accordance with NEC and device plate color coding separation.
41
- 42 L. Light Fixture Outlet Boxes:
43 1. Securely mount with approved type bar hangers spanning structural members to support
44 weight of fixture.
45 2. Do not support from conduit.
46 3. Equip with 3/8-inches fixture stud and tapped fixture ears.
47
- 48 3.07 WIRING DEVICES
49
- 50 A. Do not install devices until wiring is complete.
51
- 52 B. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or
53 otherwise. Make circuit connections by using wire connectors and pigtails.
54
55

- 1 C. Install gasket plates for devices or system components having light emitting features such as
2 switch with pilot light and dome lights. Where installed on rough textured surfaces, seal with
3 black self-adhesive polyfoam.
4
- 5 D. Ground receptacles with insulated green ground wire from device ground screw to bolted outlet
6 box connection or as shown on Drawings.
7
- 8 E. Wrap wiring devices with insulating tape.
9
- 10 F. Install emergency switches which occur adjacent to normal light switches in separate boxes to
11 maintain systems isolation in accordance with NEC.
12
- 13 3.08 MOTOR STARTERS
14
- 15 A. Examine area to receive motor starters to ensure adequate clearance for starter installation.
16
- 17 B. Anchor firmly to wall or structural surface.
18
- 19 3.09 MOTOR AND CIRCUIT DISCONNECTS.
20
- 21 A. Locate disconnect switches as shown on Drawings and required by NEC.
22
- 23 B. Provide control circuit interlock as required by NEC.
24
- 25 3.10 OVERCURRENT PROTECTIVE DEVICES.
26
- 27 A. Install fuses just prior to energizing equipment.
28
- 29 B. Locate circuit breakers as shown on Drawings.
30
- 31 C. Install GFCI receptacles as required by NEC.
32
- 33 3.11 PANELBOARDS
34
- 35 A. Flush or surface mount as specified on drawings and schedules.
36
- 37 B. Support panel cabinets independently to structure with no weight bearing on conduits.
38
- 39 C. Install recessed panelboards to allow cover to be drawn tight against wall to provide neat
40 appearance.
41
- 42 D. Install panelboards so top breaker is not higher than 6 feet-0 inches above floor.
43
- 44 E. Adjacent panel cabinets shall be same size and mounted in horizontal alignment.
45
- 46 F. Install typewritten directory in each panelboard, accurately indicating rooms or equipment being
47 served after final circuit changes have been made to balance circuit loads.
48
- 49 G. Install four spare 1 inch conduits from top of each flush mounted panelboard to area above
50 ceiling for future use. On flush mounted panelboards located on first and higher level floors,
51 provide two spare 1 inch conduits from bottom of panelboard to ceiling area of floor below for
52 future use.
53
54

1 3.12 GROUNDING AND BONDING

2
3 A. Application

- 4 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes
5 and quantities of equipment grounding conductors, except where larger sizes or more
6 conductors are indicated.
7 a. Install separate insulated equipment grounding conductors with circuit
8 conductors. Raceway may be used as equipment ground conductor where
9 feasible in non-hazardous areas and permitted by NEC for lighting circuits.
10 Install insulated equipment ground conductor in nonmetallic raceways unless
11 designated for telephone or data cables.
12 2. Underground Conductors: Bare tinned, stranded copper except otherwise indicated.
13 3. Signal and Communications: For telephone, alarm, instrumentation and communication
14 systems, provide #4 AWG minimum green insulated copper conductor in raceway from
15 grounding electrode system to each terminal cabinet or central equipment location.
16 4. Ground separately derived systems required by NEC to be grounded in accordance with
17 NEC paragraph 250-26.
18 5. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to grounding electrode
19 as indicated in addition to separate equipment grounding conductor run with supply
20 branch circuit.
21 6. Connections to Lighting Protection System: Bond grounding conductors or grounding
22 conductor conduits to lighting protection down conductors or grounding conductors in
23 compliance with NFPA 78.
24

25 B. Installation

- 26 1. General: Ground electrical systems and equipment in accordance with NEC
27 requirements except where Drawings or Specifications exceed NEC requirements.
28 2. Ground Rods:
29 a. Locate minimum of one-rod length from each other and at least same distance
30 from any other grounding electrode.
31 b. Interconnect ground rods with bare conductors buried at least 24 inches below
32 grade.
33 c. Connect bare-cable ground conductors to ground rods by means of exothermic
34 welds except as otherwise indicated.
35 d. Make connections without damaging copper coating or exposing steel.
36 e. Use 3/4-inch by 10-foot ground rods except as otherwise indicated.
37 f. Drive rods until tops are 6 inches below finished floor or final grade except as
38 otherwise indicated.
39 3. Metallic Water Service Pipe:
40 a. Provide insulated copper ground conductors, sized as indicated, in conduit
41 from building main service equipment, or ground bus, to main metallic water
42 service entrances to building.
43 b. Connect ground conductors to street side of main metallic water service pipes
44 by means of ground clamps.
45 c. Bond ground conductor conduit to conductor at each end.
46 4. Braided-Type Bonding Jumpers:
47 a. Use elsewhere for flexible bonding and grounding connections.
48 5. Route grounding conductors along shortest and straightest paths possible without
49 obstructing access or placing conductors where they may be subjected to strain, impact,
50 or damage, except as indicated.
51

52 C. Connections

- 53 1. General: Make connections to minimize possibility of galvanic action or electrolysis.
54 Select connectors, connection hardware, conductors, and connection methods so metals
55 in direct contact will be galvanically compatible.

- 1 a. Use electroplated or hot-tin-coated materials to assure high conductivity and
2 make contact points closer in order of galvanic series.
- 3 b. Make connections with clean bare metal at points of contact.
- 4 c. Aluminum to steel connections: stainless steel separators and mechanical
5 clamps.
- 6 d. Aluminum to galvanized steel connections: tin-plated copper jumpers and
7 mechanical clamps.
- 8 e. Coat and seal connections involving dissimilar metals with inert material such
9 as red lead paint to prevent future penetration of moisture to contact surfaces.
- 10 2. Exothermic Welded Connections:
 - 11 a. Use for connections to structural steel and for underground connections except
12 those at test wells.
 - 13 b. Install at connections to ground rods and plate electrodes.
 - 14 c. Comply with manufacturer's written recommendations.
 - 15 d. Welds that are puffed up or that show convex surfaces indicating improper
16 cleaning are not acceptable.
- 17 3. Terminations:
 - 18 a. Terminate insulated equipment grounding conductors for feeders and branch
19 circuits with pressure-type grounding lugs.
 - 20 b. Where metallic raceways terminate at metallic housings without mechanical
21 and electrical connection to housing, terminate each conduit with grounding
22 bushing.
 - 23 c. Connect grounding bushings with bare grounding conductor to ground bus in
24 housing.
 - 25 d. Bond electrically noncontinuous conduits at both entrances and exist with
26 grounding bushings and bare grounding conductors.
- 27
- 28 3.13 FIELD QUALITY CONTROL
- 29
- 30 A. Control Circuits, Branch Circuits, Feeders, Motor Circuits, and transformers:
 - 31 1. Megger check to phase-to-phase and phase-to-ground insulation levels.
 - 32 a. Do not megger check solid state equipment.
 - 33 2. Continuity.
 - 34 3. Short circuit.
 - 35 4. Operational check.
- 36
- 37 B. Wiring Devices:
 - 38 1. Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity,
39 proper ground connection, and wiring faults.
- 40
- 41 3.14 ADJUSTMENT AND CLEANING
- 42
- 43 A. Motor Starters and Disconnects:
 - 44 1. Adjust covers and operating mechanisms for free mechanical movement.
 - 45 2. Tighten wire and cable connections.
 - 46 3. Verify overcurrent protection thermal unit size with motor nameplate to provide proper
47 operation and compliance with NEC.
 - 48 4. Clean interior of enclosures.
 - 49 5. Touch up scratched or marred surfaces to match original finish.
- 50
- 51 B. Circuit Breakers:
 - 52 1. Adjustable settings shall be set to provide selective coordination, proper operation, and
53 compliance with NEC.
- 54
- 55

1 C. Restore damaged areas on PVC jacketed rigid conduit with spray type touch-up coating
2 compound or as directed by manufacturer.

3

4 D. Pull cleaning plug through conduits to clear of dirt, oil, and moisture.

5

6

END OF SECTION 26 20 00

SECTION 26 43 13

SURGE PROTECTION DEVICE

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 QUALITY ASSURANCE

- A. Surge suppressors shall be listed and labeled under UL 1449 Third Edition 2009.
- B. Surge suppressors shall be tested to ANSI/IEEE standards C62.41 and C62.45.
- C. Each unit shall be designed and manufactured by a qualified manufacturer of power conditioning equipment. The qualified manufacturer must have been engaged in the design and manufacturer of such products for a minimum of five (5) years.
- D. Electrical Parameters defined in this specification shall be limited to those in NEMA TVSS Specification LS1-1992 and do not include "irrelevant terminology" such as response time.

1.03 MANUFACTURERS

- A. Surge Suppressors: Current Technology, Inc. or equals approved previous to bid time.

PART 2 - PRODUCTS

2.01 SERVICE ENTRANCE TVSS - MEDIUM EXPOSURE AREAS

- A. Protection Modes: SVR(6kV, 500A) and UL1449 3rd Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltage of 208Y/120 shall be as follows and comply with test procedures outlined in UL1449 3rd Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Fourth Edition VPR Rating
120/240	L-N	150	420	642	1040	400	800
120/208	L-G	150	480	690	1300	400	800
	N-G	150	340	620	1240	400	800
	L-L	300	610	1010	1420	700	1200

- B. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220B insertion loss test method.
- C. 100 kHz at 33 db or better.
- D. All other frequencies should be 32 db or better
- E. Each Unit shall provide the following features:
 - 1. Phase Indicator lights, Form C dry contacts, surge counter and audible alarm.
 - 2. Field testable while installed.

- 1 F. The manufacturer shall provide a limited ten year warranty against failure.
- 2
- 3 G. Each individual MOV and capacitor shall be fused so that the failure of any component does
- 4 not affect the operation or protection of the entire unit.
- 5
- 6 H. Manufacturer of the TVSS device must provide certified test data from an independent test
- 7 lab showing that their unit of each rating has successfully passed the IEEE standard 8 x 20
- 8 microsecond waveform at the surge current capacity called for in the specification.
- 9
- 10 I. Surge suppressor shall be Current Technology TG100-120/208-3GY-L3 or engineer
- 11 approved equal.
- 12

13 PART 3 - EXECUTION

14 3.01 INSTALLATION

- 15
- 16
- 17 A. Each unit shall be installed per Manufacturer's recommended installation and wiring
- 18 practices, as show on the drawing supplied.
- 19
- 20 B. The UL 1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.
- 21
- 22 C. The UL 1449 Nominal Discharge Surge Current Rating shall be a minimum of 20kA
- 23
- 24 D. The SCCR rating of the SPD shall be 200kAIC without requiring an upstream protective
- 25 device for safe operation.
- 26
- 27 E. The unit shall be listed as a Type 1 SPD, suitable for use in both Type 1 and Type 2 locations
- 28 per UL1449 3rd Edition.
- 29
- 30 F. The SPD manufacturer's technician shall perform a system checkout and start-up in the field
- 31 to assure proper installation, operation and to initiate the warranty of the system. The
- 32 technician will be required to do the following:
- 33 1. Verify voltage clamping levels by using the DTS-2 test equipment.
- 34 2. Verify N-G connection where applicable.
- 35 3. Record information to product signature card for each product installed.
- 36
- 37 G. Surge Suppressors shall be installed as close as possible to the equipment being protected.
- 38
- 39 H. TVSS devices designed with replaceable modules shall be furnished with one full set of
- 40 spare modules to maintain system integrity.
- 41
- 42

END OF SECTION

SECTION 26 51 13

LIGHTING

PART 1 - GENERAL

1.01 SCOPE

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. Section Includes:
1. Interior lighting fixtures.
 2. Exterior lighting fixtures.
 3. Lamps.
 4. Ballasts.
 5. Emergency lighting units.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
1. C78 Series - Lamps.
 2. C82.2-84 - Fluorescent Lamp Ballasts.
 3. C82.4-85 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
 4. ANSI C2-90 - National Safety Code.
- B. Institute of Electrical and Electronics Engineers (IEEE):
1. C62.41-91 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Fire Protection Association (NFPA):
1. 70-93 - National Electric Code.
- D. Underwriters Laboratory (UL):
1. 844-90 - UL Standard for Safety Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
 2. 924-90 - UL Standard for Safety Emergency Lighting and Power Equipment.
 3. 935-84 - UL Standard for Safety Florescent-Lamp Ballast.
 4. 1092 (P) - UL Standard for Safety Proposed First Edition of the Standard for Process Control Equipment.
 5. 1570-88 - UL Standard for Safety Florescent Lighting Fixtures.
 6. 1571-91 - UL Standard for Safety Incandescent Lighting Fixtures.
 7. 1572-91 - UL Standard for Safety High Intensity Discharge Lighting Fixtures.
 8. 1573-85 - UL Standard for Safety Stage and Studio Lighting Units.
 9. 1574-87 - UL Standard for Safety Track Lighting Systems.
 10. UL 773-87 - UL Standard for Safety Plug-In, Locking Type Photo controls for Use with Area Lighting.

1 1.04 DEFINITIONS
2

- 3 A. Fixture: Complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps
4 and parts required to distribute light, position and protect lamps, and connect lamps to power
5 supply. Internal battery powered exit signs and emergency lighting units also include battery
6 and means for controlling and recharging battery. Emergency lighting units are available with
7 and without integral lamp heads and lamps.
8
- 9 B. Luminaire: Fixture.
- 10
- 11 C. Average Life: Time after which 50% will have failed and 50% will have survived under normal
12 conditions.
13

14 1.05 SUBMITTALS
15

- 16 A. Product Data:
17 1. Describe fixtures, lamps, ballasts, poles, emergency lighting units, and accessories.
18 Arrange product data for fixtures in order of fixture designation. Include data on features
19 and accessories and following information:
20 Outline drawings of fixtures indicating dimensions and principal features.
21 Electrical ratings and photometric data with specified lamps and certified results of
22 independent laboratory tests.
23 Data on batteries and chargers of emergency lighting units.
24
- 25 B. Shop Drawings: Detail nonstandard fixtures and indicating dimensions, weights, methods of
26 field assembly, components, features, and accessories.
27
- 28 C. Miscellaneous:
29 1. For substitutes only, product certifications signed by manufacturers of lighting fixtures
30 certifying that their fixtures comply with specified requirements.
31 2. Coordination drawings for fixtures that require coordination with other equipment
32 installed in same space.
33
- 34 D. Submit in accordance with Division 1.
35

36 1.06 QUALITY ASSURANCE
37

- 38 A. Items provided under this section shall be listed and labeled by UL or other Nationally
39 Recognized Testing Laboratory (NRTL).
40 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
41 2. Terms "listed" and "labeled" shall be as defined in National Electric Code, Article 100.
42
- 43 B. Regulatory Requirements:
44 1. National Electric Code: Components and installation shall comply with NFPA 70.
45 2. Comply with ANSI C2, "National Electrical Safety Code".
46
- 47 C. Coordinate fixtures mounting hardware and trim with ceiling tile.
48

49 1.07 WARRANTY
50

- 51 A. Requirements:
52 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish
53 due to weathering.
54 2. Color Retention: Warranty against fading, staining, chalking due to effects of weather
55 and solar radiation.

- 1 PART 2 - PRODUCTS
2
3 2.01 FIXTURES, GENERAL
4
5 A. Comply with requirements specified in Articles below and lighting fixture schedule.
6
7 2.02 FIXTURE COMPONENTS, GENERAL
8 A. Metal Parts: Free from burrs, sharp corners, and edges.
9
10 B. Sheet Metal Components: Steel, except as indicated. Form and support components to prevent
11 warping and sagging.
12
13 C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under
14 operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames,
15 lenses, diffusers, and other pieces to prevent accidental falling during relamping and when
16 secured in operating position.
17
18 D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
19 1. White surfaces: 85%.
20 2. Specular Surfaces: 83%.
21 3. Diffusing Specular Surfaces: 75%.
22 4. Laminated Silver Metallized Film: 90%.
23
24 E. Exterior Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag,
25 or deform in use. Provide filter/breather for enclosed fixtures.
26
27 F. Exterior Exposed Hardware Material: Stainless steel.
28
29 G. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed
30 crystal glass except as indicated.
31 1. Plastic: Highly resistant to yellowing and other changes due to aging, exposure to heat
32 and UV radiation.
33 2. Lens Thickness: 0.125 inches, minimum.
34
35 H. Photoelectric Relay: UL 773.
36 1. Contact Relays: Single-throw, arranged to fail in the "on" position and factory set to turn
37 light unit on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles with 15 seconds
38 minimum time delay.
39 2. Relay Mounting: In fixture housing.
40
41 2.03 SUSPENDED FIXTURE SUPPORT COMPONENTS
42
43 A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish
44 same as fixture.
45
46 B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount single
47 fixture. Finish same as fixture.
48
49 C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
50
51 D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with
52 threaded attachment, cord, and locking-type plug.
53
54 2.04 LED FIXTURES
55

-
- 1 A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product
2 Qualification Criteria. This does not require that the luminaire be listed on the DesignLights
3 Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria.
4 The technical requirements that the luminaire shall meet for each Application Category are:
5 1. Minimum Light Output.
6 2. Zonal Lumen Requirements.
7 3. Minimum Luminaire Efficacy.
8 4. Minimum CRI.
9 5. L70 Lumen Maintenance.
10 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all
11 LED components.
- 12 **Additional requirements:**
- 13 B. Color Temperature of 3000K-5000K for interior fixtures as listed in the Light Fixture Schedule
14 on the plans. The color temperature of exterior LED fixtures should not exceed 4100K
15 (nominal).
16
- 17 C. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning
18 process to achieve consistent fixture-to-fixture color for interior fixtures. Exterior fixtures shall
19 use a maximum 5-step MacAdam Ellipse binning process.
20
- 21 D. Glare Control: Exterior fixtures shall meet DesignLights Consortium's® criteria for Zonal
22 Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior
23 fixtures.
24
- 25 E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
26
- 27 F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
28
- 29 G. Light output of the LED system shall be measured using the absolute photometry method
30 following IES LM-79 and IES LM-80 requirements and guidelines.
31
- 32 H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
33
- 34 I. Driver shall have a rated life of 50,000 hours, minimum.
35
- 36 J. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
37
- 38 K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
39
- 40 L. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior fixtures, and a
41 minimum of 70 for exterior fixtures.
42
- 43 M. LED fixture shall be thermally designed as to not exceed the maximum junction temperature of
44 the LED for the ambient temperature of the location the fixture is to be installed. Rated case
45 temperature shall be suitable for operation in the ambient temperatures typically found for the
46 intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F
47 (-29°C to 50°C).
48
- 49 N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of
50 1.5 at full input power and across specified voltage range.
51
- 52 O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
53
- 54 P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power
55 and across specified voltage range.

- 1
2 Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field
3 maintenance.
4
5 R. All connections to luminaires shall be reverse polarity protected and provide high voltage
6 protection in the event connections are reversed or shorted during the installation process.
7
8 S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs
9 shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected
10 as per Class 2 UL listing.
11
12 T. All luminaires shall be provided with knockouts for conduit connections.
13
14 U. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light
15 engine(s)/board array, and driver(s).
16
17 V. Provide all of the following data on submittals:
18 1. Delivered lumens
19 2. Input watts
20 3. Efficacy
21 4. Color rendering index.
22

23 **Emergency LED Fixture Compatibility with Inverters:**

- 24 W. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire
25 manufacturer that the fixture will function with a square-wave inverter.
26

27 **Dimming:**

- 28 X. LED driver shall be compatible with dimming controls where dimming is indicated on the plans.
29 Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation
30 (PWM) operation.
31
32 Y. LED fixtures shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Light Fixture
33 Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as
34 the fixture being on a pre-set dimmed level (less than 100%), and going to 100% prior to
35 returning to the pre-set level when power is returned to the fixture.
36

37 2.05 FIXTURES FOR HAZARDOUS LOCATIONS

- 38
39 A. Conform to UL 844 or provide units that have Factory Mutual Engineering and Research
40 Corporation (FM) certification for indicated class and division of hazard.
41

42 2.06 TRACK LIGHTING SYSTEMS

- 43
44 A. Conform to UL 1574. Provide components, including track, fittings, and fixtures from same
45 manufacturer, and as recommended by manufacturer for intended purpose.
46
47 B. Stage and Studio Lighting Equipment: Conform to UL 1573.
48

49 2.07 EXIT SIGNS

- 50
51 A. Conform to UL 924.
52 1. Sign Colors: Conform to local code.
53
54 B. Self-Powered Exit Signs (Battery Type): Integral automatic high/low trickle charger in self-
55 contained power pack.

1 1. Battery: Sealed, maintenance-free, nickel cadmium type with special project warranty.

2
3 2.08 LAMPS

4
5 A. Conform to ANSI C78 series applicable to each type of lamp.

6
7 2.09 FINISH

8
9 A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of
10 streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of
11 corrosion during project warranty period and replace with new fixtures.

12
13 B. Other Parts: Manufacturer's standard finish.

14
15 C. Verify and provide light fixture finishes as selected by ARCHITECT for all light fixture types.
16 Include colored finish selection tables with product submittals. Upon request submit actual
17 material finish swatches for A/E review.

18
19 PART 3 - EXECUTION

20
21 3.01 INSTALLATION

22
23 A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure
24 according to manufacturer's printed instructions and approved submittals.

25
26 B. Support For Recessed and Semirecessed Fixtures: Units may be supported from suspended
27 ceiling support system. Install ceiling system support rods or wires at minimum of four rods or
28 wires per fixture located not more than 6 inches from fixture corners.

29 1. Fixtures Smaller Than Ceiling Grid: Install minimum of four rods or wires for each
30 fixture and locate at corner of ceiling grid where fixture is located. Do not support
31 fixtures by ceiling acoustical panels.

32 2. Fixtures of Sizes Less Than Ceiling Grid: Center in acoustical panel. Support fixtures
33 independently with at least two 3/4-inch metal channels spanning and secured to ceiling
34 tees.

35 3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or
36 near each fixture corners.

37
38 C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit
39 swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem
40 hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for
41 suspension for each unit length of chassis, including one at each end.

42
43 D. Lamping: Lamp units according to manufacturer's instructions.

44
45 3.02 GROUNDING

46
47 A. Ground fixtures and metal poles according to Section 26 20 00.

48
49 3.03 FIELD QUALITY CONTROL

50
51 A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

52
53 B. Give 7-day notice of dates and times for field tests.

- 1 C. Verify normal operation of each fixture after fixtures have been installed and circuits have been
2 energized with normal power source.
3
- 4 D. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation.
5 1. Duration of supply.
6 2. Low battery voltage shut-down.
7 3. Normal transfer to battery source and retransfer to normal.
8 4. Low supply voltage transfer.
9
- 10 E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until
11 units operate properly.
12
- 13 3.04 ADJUSTING AND CLEANING
14
- 15 A. Clean fixtures upon completion of installation. Use methods and materials recommended by
16 manufacturer.
17
- 18 B. Adjust aimable fixtures to provide required light intensities.
19
20
- END OF SECTION 26 51 13

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SECTION 27 10 00

TELECOMMUNICATIONS DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. The basic scope of this project is as follows:
1. Remove abandoned cables back to origin.
 2. Provide new cables and patch panels.
 3. Provide all certification and testing of the equipment and cabling as required.
- B. Section Includes: Equipment, materials, labor, and services to provide telephone and data distribution system including, but not limited to:
1. Raceway and boxes
 2. Telephone and data cabling terminations
 3. Telecommunications outlets
 4. Terminal blocks/cross-connect systems
 5. System testing
 6. Documentation and submissions
- C. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.
- D. Work not included:
1. The following work will be done by others:
 - a. Off-site services.
 - b. Providing data concentrators, hubs, servers, computers, and other active devices.

1.02 REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code®), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
1. ANSI/NECA/BICSI-568 -- Standard for Installing Commercial Building Telecommunications Cabling
 2. ANSI/TIA/EIA Standards
 - a. ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
 - b. ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
 - c. ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
 - d. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
 - e. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

- 1 f. ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding
- 2 Requirements for Telecommunications
- 3 g. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed
- 4 Single-Mode Fiber Cable Plant
- 5 h. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed
- 6 Multimode Fiber Cable Plant
- 7 i. ANSI/TIA/EIA-758(A)--Customer-Owned Outside Plant Telecommunications
- 8 Cabling Standard
- 9

10 B. Install cabling in accordance with the most recent edition of BICSI® publications:

- 11 1. BICSI -- Telecommunications Distribution Methods Manual
- 12 2. BICSI -- Cabling Installation Manual
- 13 3. BICSI -- LAN Design Manual
- 14 4. BICSI -- Customer-Owned Outside Plant Design Manual
- 15

16 C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as
17 fully part of the specifications as if herein repeated or hereto attached. If the contractor should
18 note items in the drawings or the specifications, construction of which would be code violations,
19 promptly call them to the attention of the owner's representative in writing. Where the
20 requirements of other sections of the specifications are more stringent than applicable codes,
21 rules, regulations, and ordinances, the specifications shall apply.

22
23 1.03 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

24
25 A. As prerequisite to final acceptance, supply to the owner certificates of inspection from an
26 inspection agency acceptable to the owner and approved by local municipality and utility
27 company serving the project.

28
29 1.04 SYSTEM DESCRIPTION

30
31 A. The typical work area consists of a single-gang plate with one to four standards compliant work
32 area outlets.
33 1. Each work area outlet consists of one (1) four-pair data Category 6 cable or above,
34 installed from work area outlet to the TR. Terminate data cables on rack mounted
35 modular patch panels located in the appropriate TR.

36
37 1.05 SUBMITTALS

38
39 A. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog
40 information), and samples required by the contract documents. Submit shop drawings, product
41 data, and samples with such promptness and in such sequence as to cause no delay in the work
42 or in the activities of separate contractors. The engineer/designer will indicate approval of shop
43 drawings, product data, and samples submitted to the engineer by stamping such submittals
44 "APPROVED" with a stamp. Submitted shop drawings shall be initialed or signed by the
45 contractor, showing the date and the contractor's legitimate firm name.

46 1. By submitting shop drawings, product data, and samples, the contractor represents that he
47 or she has carefully reviewed and verified materials, quantities, field measurements, and
48 field construction criteria related thereto. It also represents that the contractor has
49 checked, coordinated, and verified that information contained within shop drawings,
50 product data, and samples conform to the requirements of the work and of the contract
51 documents. The engineer/designer remains responsible for the design concept expressed
52 in the contract documents as defined herein.

53

- 1 2. The engineer's/designer's approval of shop drawings, product data, and samples
2 submitted by the contractor shall not relieve the contractor of responsibility for deviations
3 from requirements of the contract documents, unless the contractor has specifically
4 informed the engineer/designer in writing of such deviation at time of submittal, and the
5 engineer/designer has given written approval of the specific deviation. The contractor
6 shall continue to be responsible for deviations from requirements of the contract
7 documents not specifically noted by the contractor in writing, and specifically approved
8 by the engineer in writing.
- 9 3. The engineer's/designer's approval of shop drawings, product data, and samples shall not
10 relieve the contractor of responsibility for errors or omissions in such shop drawings,
11 product data, and samples.
- 12 4. The engineer's/designer's review and approval, or other appropriate action upon shop
13 drawings, product data, and samples, is for the limited purpose of checking for
14 conformance with information given and design concept expressed in the contract
15 documents. The engineer's/designer's review of such submittals is not conducted for the
16 purpose of determining accuracy and completeness of other details such as dimensions
17 and quantities, or for substantiating instructions for installation or performance of
18 equipment or systems, all of which remain the responsibility of the contractor as required
19 by the contract documents. The review shall not constitute approval of safety precautions
20 or of construction means, methods, techniques, sequences, or procedures. The
21 engineer's/designer's approval of a specific item shall not indicate approval of an
22 assembly of which the item is a component.
- 23
- 24 B. Perform no portion of the work requiring submittal and review of shop drawings, product data,
25 or samples, until the engineer/designer has approved the respective submittal. Such work shall
26 be in accordance with approved submittals.
- 27
- 28 C. Submit shop drawings, product data, and samples as a complete set within thirty (30) days of
29 award of contract.
 - 30 1. For initial submission and for resubmission required for approval, submit four (4) copies
31 of each item. The engineer/designer will only return two copies. Make reproductions as
32 required for your use and distribution to subcontractors.
 - 33 2. Illegible submittals will not be checked by the engineer.
- 34
- 35 D. General: Submit the following:
 - 36 1. Bill of materials, noting long lead time items
 - 37 2. Optical loss budget calculations for each optical fiber run
 - 38 3. Project schedule including all major work components that materially affect any other
39 work on the project
- 40
- 41 E. Shop drawings: Submit the following:
 - 42 1. Backbone (riser) diagrams.
 - 43 2. System block diagram, indicating interconnection between system components and
44 subsystems.
 - 45 3. Interface requirements, including connector types and pin-outs, to external systems and
46 systems or components not supplied by the contractor.
 - 47 4. Fabrication drawings for custom-built equipment.
- 48
- 49 F. Product Data -- Provide catalog cut sheets and information for the following:
 - 50 1. Wire and cable
 - 51 2. Outlets, jacks, faceplates, and connectors
 - 52 3. All metallic and nonmetallic raceways, including surface raceways, outlet boxes, and
53 fittings
 - 54 4. Terminal blocks and patch panels
- 55

- 1 G. Project record drawings:
2 1. Submit project record drawings at conclusion of the project and include:
3 a. Approved shop drawings
4 b. Plan drawings indicating locations and identification of work area outlets,
5 nodes, telecommunications rooms (TRs), and backbone (riser) cable runs
6 c. Telecommunications rooms (TRs) and equipment room (ER and/or MC)
7 termination detail sheets.
8 d. Cross-connect schedules including entrance point, main cross-connects,
9 intermediate cross-connects, and horizontal cross-connects.
10 e. Labeling and administration documentation.
11 f. Warranty documents for equipment.
12 g. Copper certification test result printouts and diskettes.
13 h. Optical fiber power meter/light source test results.
14

15 1.06 QUALITY ASSURANCE
16

- 17 A. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of
18 this type and size.
19
20 B. Upon request by the engineer/designer, furnish a list of references with specific information
21 regarding type of project and involvement in providing of equipment and systems.
22
23 C. Equipment and materials of the type for which there are independent standard testing
24 requirements, listings, and labels, shall be listed and labeled by the independent testing
25 laboratory.
26
27 D. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA -
28 National Electrical Manufacturers Association), this equipment shall be labeled as certified or
29 complying with standards.
30
31 E. Material and equipment shall be new, and conform to grade, quality, and standards specified.
32 Equipment and materials of the same type shall be a product of the same manufacturer
33 throughout.
34
35 F. Subcontractors shall assume all rights and obligations toward the contractor that the contractor
36 assumes toward the owner and engineer/designer.
37

38 1.07 WARRANTY
39

- 40 A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and
41 workmanship for a period of not less than fifteen (15) years from date of acceptance by the
42 owner. The owner shall deem acceptance as beneficial use.
43
44 B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee.
45 Submit these warranties on each item in list form with shop drawings. Detail specific parts
46 within equipment that are subject to separate conditional warranty. Warranty proprietary
47 equipment and systems involved in this contract during the guarantee period. Final payment
48 shall not relieve you of these obligations.
49
50

- 1 1.08 DELIVERY, STORAGE, AND HANDLING
2
3 A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and
4 misalignment. Coordinate with the owner for secure storage of equipment and materials. Do
5 not store equipment where conditions fall outside manufacturer's recommendations for
6 environmental conditions. Do not install damaged equipment; remove from site and replace
7 damaged equipment with new equipment.
8
9 1.09 SEQUENCE AND SCHEDULING
10
11 A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and
12 testing for conformance to specific job completion dates. As a minimum, dates are to be
13 provided for bid award, installation start date, completion of station cabling, completion of riser
14 cabling, completion of testing and labeling, cutover, completion of the final punch list, start of
15 demolition, owner acceptance, and demolition completion.
16
17 1.10 USE OF THE SITE
18
19 A. Use of the site shall be at the owner's direction in matters in which the owner deems it necessary
20 to place restriction.
21
22 B. Access to building wherein the work is performed shall be as directed by the owner.
23
24 C. The owner will occupy the premises during the entire period of construction for conducting his
25 or her normal business operations. Cooperate with the owner to minimize conflict and to
26 facilitate the owner's operations.
27
28 D. Schedule necessary shutdowns of plant services with the owner, and obtain written permission
29 from the owner. Refer to article - CONTINUITY OF SERVICES herein.
30
31 E. Proceed with the work without interfering with ordinary use of streets, aisles, passages, exits,
32 and operations of the owner.
33
34 1.11 CONTINUITY OF SERVICES
35
36 A. Take no action that will interfere with, or interrupt, existing building services unless previous
37 arrangements have been made with the owner's representative. Arrange the work to minimize
38 shutdown time.
39
40 B. Owner's personnel will perform shutdown of operating systems. The contractor shall give three
41 (3) days' advance notice for systems shutdown.
42
43 C. Should services be inadvertently interrupted, immediately furnish labor, including overtime,
44 material, and equipment necessary for prompt restoration of interrupted service.
45
46 PART 2 - PRODUCTS
47
48 2.01 MANUFACTURERS
49
50 A. Basis of Design:
51 1. Hubbell Nextspeed CMP cable (blue)
52

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Channel Requirements:

Insertion Loss:	250 MHz	34.1 dB
NEXT:	250 MHz	36.1 dB
PS NEXT:	250 MHz	33.2 dB
ACR:	250 MHz	3.0 dB
PS ACR:	250 MHz	1.3 dB
ELFEXT	250 MHz	19.3 dB
PS ELFEXT:	250 MHz	15.3 dB
Return Loss:	250 MHz	10 dB

2.02 FABRICATION

- A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installation.

2.03 SUITABILITY

- A. Provide products that are suitable for intended use, including, but not limited to environmental, regulatory, and electrical.

2.04 STATION CABLE

- A. VOICE and DATA TELECOMMUNICATIONS STATION CABLE
 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.
 - a. Listed Type CMP.

2.05 WORK AREA OUTLETS

- A. VOICE/DATA WORK AREA OUTLETS (Copper only)
 1. Single-gang high impact plastic mounting plate with four (4) openings containing the following devices:
 - a. Voice Outlet - 8-pin modular, Category 6, unkeyed, ivory, pinned to T568A standards.
 - b. Data Outlet - 8-pin modular, Category 6, unkeyed, ivory, pinned to T568A standards.

- B. WALL VOICE OUTLETS

1. Single-gang stainless steel faceplate with six-conductor jack and wall telephone mounting lugs

2.06 PATCH PANELS

- A. 19 in. rack mountable, 24-port 8-pin modular to insulation displacement connector (IDC) meeting Category 6 performance standards, and pinned to T568 A standards. Typical examples of IDC connections are the 110, BIX, and Krone.

1 PART 3 - EXECUTION

2
3 3.01 PRE-INSTALLATION SITE SURVEY

4
5 A. Prior to start of systems installation, meet at the project site with the owner's representative and
6 representatives of trades performing related work to coordinate efforts. Review areas of
7 potential interference and resolve conflicts before proceeding with the work. Facilitation with
8 the General Contractor will be necessary to plan the crucial scheduled completions of the
9 equipment room and telecommunications closets.

10
11 B. Examine areas and conditions under which the system is to be installed. Do not proceed with
12 the work until satisfactory conditions have been achieved.

13
14 C. The contractor shall be responsible for meeting with the Owner's Information Technology staff
15 prior to the start of any installation to coordinate the work to be installed as part of this project.
16 It is the design intent to maintain any cabling or installation standards that are currently in use
17 by Dane County.

18 1. Failure to perform this meeting may cause work to be removed and reinstalled if not
19 deemed acceptable by the City of Madison.

20
21 3.02 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

22
23 A. Be responsible for safekeeping of your own and your subcontractors' property, such as
24 equipment and materials, on the job site. The owner assumes no responsibility for protection of
25 above named property against fire, theft, and environmental conditions.

26
27 3.03 PROTECTION OF OWNER'S FACILITIES

28
29 A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage
30 during construction.

31
32 B. Remove protection at completion of the work.

33
34 3.04 INSTALLATION

35
36 A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be
37 installed as part of the contract. Store in areas as directed by the owner's representative. Include
38 delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures
39 where required, interconnecting wiring of system components, equipment alignment and
40 adjustment, and other related work whether or not expressly defined herein.

41
42 B. Install materials and equipment in accordance with applicable standards, codes, requirements,
43 and recommendations of national, state, and local authorities having jurisdiction, and National
44 Electrical Code® (NEC) and with manufacturer's printed instructions.

45
46 C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and
47 sidewall pressure when installing cables.

48 1. Where manufacturer does not provide bending radii information, minimum-bending
49 radius shall be 15 times cable diameter. Arrange and mount equipment and materials in a
50 manner acceptable to the engineer and the owner.

51
52 D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC)
53 or galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing,
54 utilizing a firestopping assembly approved for that application.

- 1 E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.
2
3 F. Installation shall conform to the following basic guidelines:
4 1. Use of approved wire, cable, and wiring devices
5 2. Neat and uncluttered wire termination
6
7 G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches.
8 Support cables installed above removable ceilings.
9
10 H. Install adequate support structures for 10 foot of service slack at each TR.
11
12 I. Support riser cables every three (3) floors and at top of run with cable grips.
13 1. Limit number of four-pair data riser cables per grip to fifty (50)
14
15 J. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the
16 drawings or noted below.
17
18 K. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental
19 contact with power conductors.
20
21 3.05 GROUNDING
22
23 A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and
24 Bonding Requirements for Telecommunications, National Electrical Code®,
25 ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum.
26
27 B. Bond and ground equipment racks, housings, messenger cables, and raceways.
28
29 C. Connect cabinets, racks, and frames to single-point ground which is connected to building
30 ground system via #6 AWG green insulated copper grounding conductor.
31
32 3.06 LABELING
33
34 A. Labeling shall conform to ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
35 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high
36 characters.
37 2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high
38 characters, in the following locations:
39 a. Inside receptacle box at the work area.
40 b. Behind the communication closet patch panel or punch block.
41 c. Use labels on face of data patch panels. Provide facility assignment records in
42 a protective cover at each telecommunications closet location that is specific to
43 the facilities terminated therein.
44 d. Use color-coded labels for each termination field that conforms to
45 ANSI/TIA/EIA-606(A) standard color codes for termination blocks.
46 e. Mount termination blocks on color-coded backboards.
47 f. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
48 g. Label cables, outlets, patch panels, and punch blocks with room number in
49 which outlet is located, followed by a single letter suffix to indicate particular
50 outlet within room, i.e., S2107A, S2107B. Indicate riser cables by an R then
51 pair or cable number.
52 h. Mark up floor plans showing outlet locations, type, and cable marking of
53 cables. Turn these drawings over to the owner two (2) weeks prior to move in
54 to allow the owner's personnel to connect and test owner-provided equipment
55 in a timely fashion.

- 1 i. Three (3) sets of as-built drawing shall be delivered to the owner within four
 2 (4) weeks of acceptance of project by the owner. A set of as-built drawings
 3 shall be provided to the owner in magnetic media form (3.5" floppy disks) and
 4 utilizing CAD software that is acceptable to the owner. The magnetic media
 5 shall be delivered to the owner within six (6) weeks of acceptance of project
 6 by owner.

7
 8 **3.07 TESTING**

- 9
 10 A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished
 11 using level IIe or higher field testers.
 12
 13 B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct
 14 grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is
 15 caused by improper termination. If termination is proper, tag bad pairs at both ends and note on
 16 termination sheets.
 17 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.1
 18 requirements.

19
 20 **Category 6 Test Parameters:**

21

Frequency Mhz	Category 6 Cable Permanent Link Test					
	TIA/EIA 568B.2-1 Insertion Loss Attenuation	TIA/EIA 568B.2-1 NEXT Worst Pair to Pair dB	TIA/EIA 568B.2-1 PSNEXT Worst Case Loss dB	TIA/EIA 568B.2-1 ELFEXT Worst Pair to Pair Loss DB	TIA/EIA 568B.2-1 PSELFEXT Loss dB	TIA/EIA 568B.2-1 Return Loss dB
	Max. dB					
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	34.1	36.1	33.2	19.3	15.3	10.0

- 22
 23 C. Propagation Delay
 24 1. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –
 25 568B.2 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz.
 26 (Note: In determining the permanent link propagation delay, the propagation delay
 27 contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to
 28 250MHz).
 29
 30 D. Delay Skew
 31 1. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew
 32 shall not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In
 33 addition, the propagation delay skew between all pairs shall not vary more than +/- 10ns
 34 from the measured value at 20 degrees C when measured at 40 degrees C and 60 degrees
 35 C. Compliance shall be determined using a minimum 100m of cable.
 36
 37

- 1 E. In order to establish testing baselines, cable samples of known length and of the cable type and
2 lot installed shall be tested. The cable may be terminated with an 8-position Category 6
3 Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal
4 attenuation values shall be calculated based on this test and be utilized during the testing of the
5 installed cable plant. This requirement can be waived if NPV data is available from the cable
6 manufacturer for the exact cable type under test.
7
- 8 F. In the event results of the tests are not satisfactory, the Contractor shall make adjustments,
9 replacement and changes as are necessary, and shall then repeat the test or tests which disclosed
10 faulty or defective material, equipment or installation method, and shall make additional tests as
11 the Engineer deems necessary at no additional expense to the project or user agency.
12
- 13 G. Where any portion of system does not meet the specifications, correct deviation and repeat
14 applicable testing at no additional cost to the owner.
15
- 16 3.08 FIELD QUALITY CONTROL
17
- 18 A. Employ job superintendent or project manager during the course of the installation to provide
19 coordination of work of this specification and of other trades, and provide technical information
20 when requested by other trades. This person shall maintain current RCDD® (Registered
21 Communications Distribution Designer) registration and shall be responsible for quality control
22 during installation, equipment set-up, and testing.
23
- 24 B. At least 30 percent of installation personnel shall be BICSI Registered Telecommunications
25 Installers. Of that number, at least 15 percent shall be registered at the Technician Level, at
26 least 40 percent shall be registered at the Installer Level 2, and the balance shall be registered at
27 the Installer Level 1.
28
- 29 C. Installation personnel shall meet manufacturer's training and education requirements for
30 implementation of extended warranty program.
31

32 END OF SECTION 27 10 00
33
34

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Applicable provisions of Division 1 shall govern all work under this section.
- B.
- C. Provide an intelligent, addressable, noncoded, continuous sounding, UL listed, electrically supervised system, complete, tested, and ready for operation.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA No. 70 - National Electric Code (NEC).
 - b. NFPA No. 101 - Life Safety Code.
 - 2. Wisconsin Administrative Code.
 - 3. Underwriters Laboratories, Inc.
 - 4. Local codes and ordinances.
 - 5. ADA
- B. Reference Standards:
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA No. 72
 - 2. National Electrical Manufacturer's Association (NEMA).
- C. System equipment to be of one manufacturer and supported by factory trained, established service organization of equipment manufacturer who shall stock parts for equipment supplied.
- D. Equipment must be manufactured by firm actively manufacturing fire alarm systems for minimum of 10 years.
- E. Manufacturer's Services:
 - 1. Manufacturer's representative factory trained service engineer for equipment specified herein shall be present at job site to supervise final adjustment of system after installation complete, equipment startup, and training of OWNER'S personnel for system operation.
 - 2. Manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system related areas.

1.03 SUBMITTALS

- A. Shop Drawings to include:
 - 1. Data sheets and equipment description.
 - 2. Bill of materials listing components.
 - 3. Component wiring diagrams.
 - 4. System wiring and interconnection diagrams showing all devices – not a typical diagram.
- B. Operation and Maintenance (O & M) Data: Submit in accordance with Division 1. Provide electronic record drawings in Autocad Version 2013 or newer on CD.

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C. Field quality control test results.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Receive equipment at jobsite, verify applicable components and quantity delivered per invoice.
- B. Handle equipment to prevent internal components damage, breakage, denting, and scoring enclosure and finish.
- C. Do not install damaged equipment.
- D. Store equipment in clean, dry space and protect from dirt, fumes, water, construction debris, and physical damage.
- E. After installation, protect from damage by Work of other trades.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Use of manufacturer's name and model or catalog number is for purpose of establishing standard of quality, general configuration, and operating characteristics desired only.

2.02 ACCEPTABLE MANUFACTURERS

- A. Notifier Company
- B. Or approved equivalent by:
 - 1. Simplex Time Recorder Company
 - 2. Siemens Cerberus Pyrotronics
 - 3. EST Edwards
 - 4. Gamewell

2.03 SYSTEM OPERATION

- A. Alarm devices to sound continuously upon actuation of alarm initiating devices and indicate on LCD screen on face of control panel and on remote LCD annunciator.
- B. Actuation of alarm initiating devices shall automatically cause following operations.
 - 1. Sound audio and audio/visual devices automatically (Synchronized, temporal building wide).
 - 2. Activate all strobes automatically (Synchronized building wide).
 - 3. Indicate on control panel device initiating alarm and/or trouble condition on 80 character display.
 - 4. Indicate reporting device on remote annunciator.
 - 5. Transmit signal to central station (via leased telephone lines).
 - 6. Stop air supply and return fans.
 - 7. Disengage magnetic door holder units.
 - 8. Close smoke dampers.
 - 9. Display alarm, supervisory or trouble condition on 80 character display.
 - 10. Perform programmed interlocks.
- C. Provide Dedicated 120 volt, 60 hertz, input power.

- 1 2.04 FIRE ALARM CONTROL PANEL
2
3 A. Fire alarm control panel shall be Notifier model NFW2-100, with solid state modular design
4 capable of future expansion.
5
6 B. Includes features:
7 1. 198 intelligent device capability (total of addressable detectors and modules)
8 2. Up to (8) ANN_BUS annunciators
9 3. UL 864 listed, 9th edition.
10 4. Auto-program mode
11 5. Four on-board NAC circuits
12 6. Selectable strobe synchronization for System Sensor, Wheelock or Gentex devices
13 7. Remote acknowledge, silence, reset and drill via addressable monitor modules
14 8. Integral backlit 80 character LCD display
15 9. Realtime clock/calendar with auto daylight savings time
16 10. 1000 event history file
17 11. Detector sensitivity test capability (NFPA 72 compliant)
18 12. Maintenance alert
19 13. One person audible or silent walk-test with walk-test log and print out
20 14. Point trouble identification
21 15. Waterflow (non-silenceable) selection by point
22 16. System alarm verification selection per alarm point
23 17. On-board DACT
24 18. Positive Alarm Sequence and Pre-signal per point
25 19. 2.5A total power available for NAC's
26 20. Two programmable relays and one fixed trouble output relay
27 21. Sixteen key alpha-numeric keypad
28 22. Battery standby, 12 volt, Gel-Cell type (two required) with sufficient power capacity
29 to power the fire alarm for not less than twenty-four hours plus five minutes of alarm
30 upon a normal AC power failure.
31
- 32 2.05 SMOKE DETECTION
33
34 A. Smoke detectors shall be Photoelectric type NP-100.
35
36 B. Duct smoke detector shall be Photoelectric type ND-100.
37 1. Sampling tube as required for duct width dimensions.
38
- 39 2.06 ISOLATION MODULES
40
41 A. Isolation module shall be model N100-ISO.
42
- 43 2.07 HEAT DETECTION
44
45 A. Heat detector shall be model NH-100.
46
47 B. Heat detector for unconditioned spaces (attic) shall be model 5602 and monitored by NMM-
48 100 monitor module.
49
- 50 2.08 MODULES
51
52 A. Monitor module shall be model NMM-100.
53
54 B. Control module shall be NC-100.
55

1 2.09 PULL STATIONS

- 2
3 A. Pull station shall be a model NOT-NBG12LX.
4

5 2.10 SIGNALS

- 6
7 A. Horn/strobe unit shall be model GEC3-24WR (Wall) / GCC24-CW (Ceiling):
8 1. 100dB at 10 feet sound pressure. (anechoic)
9 2. Temporal audio output (synchronized).
10 3. 15cd, 30cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela
11 requirements).
12 4. Mounts on 4" square or 4" square with 1- or 2-gang ring.
13
14 B. Strobe unit shall be model GES-24-WR (Wall) / GCS24-CW (Ceiling):
15 1. 15cd, 30cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela
16 requirements).
17 2. Mounts on 4" square box or 4" square with 1- or 2-gang ring.
18
19 C. Horn units shall be GEH-24R:
20 1. 100dB at 10 feet sound pressure.
21 2. Temporal audio output (synchronized).
22 3. Mounts on 4" square with 1- or 2-gang ring
23
24 D. Mini-Horn shall be GX93-R (red):
25 1. Temporal audio output (synchronized)
26 2. Mounts on 4" square with 1- or 2-gang ring.
27 3. Provide one per bedroom to assure 70 dB at pillow.
28

29 2.11 REMOTE ANNUNCIATOR

- 30
31 A. Remote annunciator shall be N-ANN-80:
32 1. 80 character display.
33 2. Function switches which can be displayed.
34 3. Back box furnished with annunciator and locking flush trim.
35

36 2.12 NOTIFICATION APPLIANCE CIRCUIT PANEL

- 37
38 A. Notification Appliance Circuit Panel (NAC) shall be ASPS-2406 or FCPS24-S8:
39 1. Four (4) signal circuits (synchronized temporal & synchronized strobe).
40 2. 6.0 amp filtered 24V DC power supply.
41 3. Supervised power supply.
42 4. Battery stand-by, 12V, 12 AH Gel-Cell Batteries (2 required per panel).
43

44 2.13 CENTRAL STATION ALARM TIE

- 45
46 A. Provide as part of main fire alarm control panel.
47 1. Necessary apparatus to transmit signal intelligence from local system to central
48 station over voice grade telephone line.
49 2. Key operated cut-off switch.
50 3. Trouble lamp and silencing switch.
51

1 2.14 FLOW, PRESSURE AND TAMPER SWITCHES
2

- 3 A. Wire and install in accordance with requirements of other specification sections and wire as
4 specified in this section. Provide necessary monitor modules and circuits. Wire and install
5 outdoor sprinkler alarm bell. Flow, pressure, tamper switches and sprinkler alarm bell
6 furnished by others.
7

8 2.15 SLAVE FAN RELAY
9

- 10 A. Slave fan relay shall be Notifier model C-215D, SPDT contacts, 5 amperes, 120 vac.
11 1. Relay Coil: 24 vdc.
12

13 PART 3 - EXECUTION
14

15 3.01 INSPECTION
16

- 17 A. Examine areas and conditions under which fire alarm system to be installed and notify
18 ENGINEER in writing of conditions detrimental to proper and timely completion of Work.
19

20 3.02 INSTALLATION
21

- 22 A. Installation of the Fire Alarm/Life Safety System shall be in strict compliance with
23 manufacturer's recommendations. Consult the manufacturer's Control Panel and Peripheral
24 Equipment installation manuals for all wiring diagrams, schematics, physical equipment
25 sizes, etc. before beginning system installation. Refer to the Riser/Connection diagram for
26 all specific System Installation Termination Wiring Data. Provide (3) copies to CM prior to
27 beginning work.
28

29 B. Power Requirements:

- 30 1. The Fire Alarm Control Panel (FACP) and/or Notification Appliance Circuit (NAC)
31 panels shall be connected to a separate 20 ampere, 120 volt dedicated branch circuit
32 labeled as FIRE ALARM.
33 2. The Control Panel Cabinet shall be grounded securely using a copper grounding
34 conductor.
35 3. Conduit shall enter into the Fire Alarm Control panel backbox only at those areas of
36 the back box which have factory conduit knockouts.
37 4. All field wiring shall be completely supervised. In the event of a primary power
38 failure, disconnected standby battery, removal of any internal modules, or any open
39 circuits in the field wiring; an audible and visual trouble signal will be activated
40 until system and its associated field wiring are restored to normal condition.
41

- 42 C. Cables must be separated from any open conductors of Power, or Class 1 circuits, and shall
43 not be placed in any conduit, junction box or raceway containing these conductors, as per
44 NEC Article 760-29.
45

- 46 D. SLC loops shall be loaded to no more than 75% of their capacity.
47

- 48 E. Install wiring in accordance with Section 16001 and shall be in accordance with the NEC,
49 NFPA 72 1999, local and state codes, as shown on the drawings, and as recommended by the
50 major equipment manufacturer. See Article 3.06 FREE AIR CABLING for further
51 requirements.

- 52 1. SLC loop shall be 2 #16 shielded FPLR or FPLP cable as required.
53

- 1 2. Signal circuit wiring shall be 2 conductor #14 or 2 conductor #12 FPLR or FPLP
2 cable as required. 2#14 or 2#12 THHN is acceptable if signal circuits are enclosed in
3 listed raceway. Synchronization modules shall be utilized to provide audio and
4 visual synchronization over 2 conductors. Consult loading chart for proper wire
5 gauge and wire length to insure against excessive DC voltage drop. A minimum of
6 20.5V DC must be available at the last signal of a NAC under full alarm condition.
7 3. Provide 2 #14 from control panel or door holder power supply to door holders.
8
9 F. Provide all fire alarm system wiring drops to devices within raceways and junction boxes.
10 Where existing conditions prohibit fishing existing walls, so as to avoid excessive cutting
11 and restoration metallic wiremold finished to match existing wall surface shall be permitted
12 where allowed by OWNER/ENGINEER, routing subject to OWNER/ENGINEER approval.
13 Install conduit in accordance with Section 26 05 00 and as shown on Drawings.
14
15 G. All fire detection and alarm system devices, control panels and remote annunciators shall be
16 flush mounted when located in finished areas and may be surface mounted when located in
17 unfinished areas.
18
19 H. Smoke detectors shall not be installed prior to the system programming and test period. If
20 construction is ongoing during this period, measures shall be taken to protect smoke
21 detectors from contamination and physical damage.
22
23 I. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished
24 areas and may be exposed in unfinished areas if approved by Owner/Engineer before
25 installation. All system junction boxes shall be as manufactured by system supplier or
26 painted red and stenciled with fire alarm system designation.
27
28 J. All fire detection and alarm system devices shall be flush mounted when located in finished
29 areas and may be surface mounted when located in unfinished areas if approved by
30 Owner/Engineer before installation.
31
32 K. All conductor identification shall be labeled in accordance with 16001 at all accessible
33 locations including at control panel, junction boxes and at devices for future tracing and
34 maintenance.
35
36 L. Provide concealed 3/4" conduit and wire to telephone terminal board from main fire alarm
37 control panel.
38
39 M. Coordinate connections with supplier of central station network system.
40

41 3.03 ADJUSTMENT AND CLEANING

- 42
43 A. Clean system equipment and enclosure of dirt and debris.
44

45 3.04 FIELD QUALITY CONTROL

- 46
47 A. Provide the service of a NICET certified, Level II minimum, factory-trained technician
48 authorized by the manufacturer of the fire alarm equipment to technically supervise and
49 participate during all of the adjustments and test for the system.
50
51 B. System shall test free from grounds, opens, and short circuits.
52
53 C. Upon completion of installation of fire alarm equipment, CONTRACTOR shall provide
54 ENGINEER with signed written statement substantially in form as follows.
55

1 D. "The undersigned having been engaged as the CONTRACTOR on the Park Edge/Park Ridge
2 Employment Center confirms the fire alarm equipment was installed in accordance with
3 wiring diagrams, instructions, and directions provided to us by the manufacturer."
4

5 3.05 WARRANTY

6
7 A. All work performed and all material and equipment furnished under this contract shall be
8 from defects and shall remain so for a period of at least one (1) year from the date of
9 acceptance. The full cost of maintenance, labor and materials required to correct any defect
10 during this one year period shall be included in the submittal bid.
11

12 3.06 FREE AIR WIRING

13
14 A. All wiring shall be run "free-air", in conduit or in surface raceway. "Free-air" wiring is
15 allowed where it can be completely concealed. If wiring cannot be concealed, it shall be
16 installed in wiremold in finished areas and in conduit in unfinished areas.
17

18 B. Where installed "free-air", comply with the following:
19 1. Cable shall run at right angles and be kept clear of other trades work.
20 2. Cables shall be supported according to code utilizing bridle rings anchored to ceiling
21 concrete, piping supports or structural steel beams. Rings shall be designed to
22 maintain cables bend to larger than the minimum bend radius (typically 4 x cable
23 diameter).
24 3. Supports shall be spaced at a maximum 4-foot interval unless limited by building
25 construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be
26 used.
27 4. Cable shall never be laid directly on the ceiling grid.
28 5. Cables shall not be attached to or supported by, existing cabling, plumbing or steam
29 piping, ductwork, ceiling supports or electrical or communications conduit.
30 6. A coil of 2 feet in each cable shall be placed in the ceiling at each "free-air" wired
31 fire alarm device. These "service loops" shall be secured at the last cable support
32 before the cable reaches the device and shall be coiled from 100% to 200% of the
33 cable recommended minimum bend radius.
34 7. Devices wired with conduit shall be provided with an 8-inch wire tail at each device
35 box and 36-inch wire tails at the FACP and FAAP.
36 8. To reduce or eliminate EMI, the following minimum separation distances from
37 ≤480V Power lines shall be adhered to:
38 a. Twelve (12) inches from power lines of <5-kVa.
39 b. Eighteen (18) inches from high voltage lighting (including fluorescent).
40 c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
41 d. Thirty-nine (39) inches from transformers and motors.
42 9. All cable shall be free of tension at both ends. In cases where the cable must bear
43 some stress, Kellem grips shall be used to spread the strain over a longer length of
44 cable.
45 10. Manufacturers minimum bend radius specifications shall be observed in all
46 instances. Care should be taken in the use of cable ties to secure and anchor the
47 station cabling. Ties should not be over tightened as to compress the cable jacket.
48 No sharp burrs should remain where excess length of the cable tie has been cut.
49 11. All vertical cable extensions to fire alarm devices located below the finished ceiling
50 shall be in conduit.
51

1 C. Contractor shall furnish all required installation tools to facilitate cable pulling without
2 damage to the cable jacket. Such equipment is to include, but not limited to, sheaves,
3 winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and
4 similar devices. All equipment shall be of substantial construction to allow steady progress
5 once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a
6 hazard to the cable, shall not be used.

7
8 D. All cable shall be pulled by hand unless installation conditions require mechanical assistance.
9 Where mechanical assistance is used, care shall be taken to insure that the maximum tensile
10 load for the cable as defined by the manufacturer is not exceeded. This may be in the form
11 of continuous monitoring of pulling tension, use of a “break-away” or other approved
12 method.

13
14 3.07 DEPARTMENT OF COMMERCE SUBMITTALS

15
16 A. This Contractor is responsible for making required Department of Commerce submittals.

17
18 B. Pay Department of Commerce fees for reviewing submittal.

19
20 C. Make submittal after engineering review has been obtained for shop drawings.

21
22 D. Incorporate any Department of Commerce comments into shop drawings and as-builts.

23
24 E. This Contractor is responsible to pay all local fire department fees.

25
26
27

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Asphalt surface treatments.

B. Related Requirements:

1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
2. Section 32 13 13 "Concrete Paving" for joint sealants and fillers at pavement terminations.
3. Geotechnical Report prepared by CGC, Inc, and dated November 8, 2013.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: For each job mix proposed for the Work.

1.05 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material. Retain "Material Test Reports" Paragraph below for material test reports that are Contractor's responsibility.

B. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by Dane County, the Wisconsin Department of Transportation, and/or authorities having jurisdiction where the Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

- 1 C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements
2 of the Wisconsin Department of Transportation for asphalt paving work.
3

4 1.07 FIELD CONDITIONS
5

- 6 A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if
7 rain is imminent or expected before time required for adequate cure, or if the following conditions
8 are not met:
9 1. Prime Coat: Minimum surface temperature of 60 deg F.
10 2. Tack Coat: Minimum surface temperature of 60 deg F.
11 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
12 4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of
13 placement.
14 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
15
16

17 PART 2 - PRODUCTS
18

19 2.01 AGGREGATES
20

- 21 A. General: Use materials and gradations that have performed satisfactorily in previous installations of
22 this type and extent, located in Dane County, Wisconsin and that conform to the Wisconsin
23 Department of Transportation Standard Specifications for Highway and Structures Construction
24 (SSHSC), Section 460 – Hot Mix Asphalt Pavement.
25
26 B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured,
27 crushed blast-furnace slag.
28
29 C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from
30 stone, gravel, cured blast-furnace slag, or combinations thereof.
31 1. For hot-mix asphalt, limit natural sand to a maximum of 10 percent by weight of the total
32 aggregate mass.
33
34 D. Mineral Filler: ASTM D 242/D 242M or AASHTO M 17, rock or slag dust, hydraulic cement, or
35 other inert material, if required.
36

37 2.02 ASPHALT MATERIALS
38

- 39 A. Asphalt Binder: AASHTO M 320, PG 64-22.
40
41 B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material.
42
43 C. Cutback Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.
44
45 D. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt.
46
47 E. Water: Potable.
48

49 2.03 AUXILIARY MATERIALS
50

- 51 A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement and reclaimed,
52 unbound-aggregate base material from sources and gradations that have performed satisfactorily in
53 previous installations, equal to performance of required hot-mix asphalt paving produced from all
54 new materials.

- 1
2 B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as
3 "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable
4 powder form.
5
6 C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.
7
8 D. Geogrid Reinforcement for Heavy-Duty Asphalt Pavements: The Contractor may opt to provide a
9 thinner asphalt pavement profile, with geogrid reinforcement, in accordance with Section 6,
10 "Pavement Design" of the Project Geotechnical Report by CGC Inc to simplify grading operations.
11 Contractor must obtain written approval from project Architect prior to modify the pavement profiles
12 indicated in the Working Drawings and should, at all times, adhere to the recommendations in the
13 Geotechnical Report.
14
15 2.04 MIXES
16
17 A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities
18 having jurisdiction and in conformance with WisDOT SSHSC Section 460 and complying with the
19 following requirements:
20 1. Provide Mixture Type E-~~0-33.0~~ from the WisDOT SSHSC Section 460-2 per Geotechnical
21 Report recommendations; ensure this design mix has a strong history of satisfactory
22 performance in geographical area where Project is located.
23
24 2.05 PAVEMENT MARKINGS
25
26 A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, for use over
27 asphaltic surfaces, and complying with AASHTO M 248, Type N or Type F; colors complying with
28 FS TT-P-1952.
29 1. Color: White
30
31
32 PART 3 - EXECUTION
33
34 3.01 EXAMINATION
35
36 A. Verify that subgrade is dry and in suitable condition to begin paving.
37
38 B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets
39 and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
40 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction
41 perpendicular to first direction. Limit vehicle speed to 3 mph.
42 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
43 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as
44 determined by Architect, and replace with compacted backfill or fill as directed.
45 4. Refer to Section 1, Site Preparation of the Project Geotechnical Report for additional
46 information and direction on correcting soft/yielding areas.
47 5. Due to the nature of the existing clay subsoils, significant undercutting and stabilization may
48 be required during site preparation for pavements.
49
50 C. Proceed with paving only after unsatisfactory conditions have been corrected.
51
52 3.02 SURFACE PREPARATION
53

- 1 A. General: Immediately before placing asphalt materials, remove loose and deleterious material from
2 substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
3
- 4 B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written
5 application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base
6 before applying paving materials.
7 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
8
- 9 3.03 PAVEMENT REPAIRS
- 10
- 11 A. Sawcut all pavement surfaces to neat and straight lines at the limits of removal by a two-step
12 method. Limit the initial pavement removal to the immediate area of the proposed work. Full depth
13 sawcutting is not required for this phase of removal. After the work is completed, make a full depth
14 sawcut to neat and straight lines outside the widest point of pavement disruption. Sawcut the lines of
15 the repair parallel to existing joints, or parallel to or perpendicular to pavement edges so as to form a
16 neat patch. Carefully remove all remaining pavement within the sawcut area to the lines of the
17 sawcut. Do not disturb the existing base materials between the area disturbed by the work and the
18 sawcut line by the sawcutting, pavement removal, or pavement replacement processes.
19
- 20 B. Remove all walks, curbs, and other jointed paving by sawcutting at the nearest joint beyond the
21 limits of removal.
22
- 23 C. Adjust all inlets, manholes, catch basins, valve boxes, and other such castings to match new finished
24 grade as incidental work.
25
- 26 3.04 PLACING HOT-MIX ASPHALT
- 27
- 28 A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt
29 mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place
30 each course to required grade, cross section, and thickness when compacted.
31 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
32 2. Place hot-mix asphalt surface course in single lift.
33 3. Spread mix at a minimum temperature of 250 deg F.
34 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-
35 way slopes unless otherwise indicated.
36 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in
37 asphalt-paving mat.
38
- 39 B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width
40 are required.
41 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to
42 overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to
43 ensure proper compaction of mix along longitudinal joints.
44 2. Complete a section of asphalt base course before placing asphalt surface course.
45
- 46 C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to
47 remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent
48 segregation of mix; use suitable hand tools to smooth surface.
49
- 50 3.05 JOINTS
- 51
- 52 A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints
53 free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
54 1. Clean contact surfaces and apply tack coat to joints.

- 1 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
2 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
3 4. Construct transverse joints at each point where paver ends a day's work and resumes work at
4 a subsequent time. Construct these joints using either "bulkhead" or "papered" method
5 according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
6 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive
7 displacement.
8 6. Compact asphalt at joints to a density within 2 percent of specified course density.
9
- 10 3.06 **COMPACTION**
11
- 12 A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without
13 excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate
14 compactors in areas inaccessible to rollers.
15 1. Complete compaction before mix temperature cools to 185 deg F.
16
- 17 B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and
18 outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and
19 smoothness. Correct laydown and rolling operations to comply with requirements.
20
- 21 C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix
22 asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course
23 has been uniformly compacted to the following density:
24 1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 [or]
25 AASHTO T 245, but not less than 94 percent or greater than 100 percent.
26 2. Average Density: 92 percent of reference maximum theoretical density according to
27 ASTM D 2041, but not less than 90 percent or greater than 96 percent.
28
- 29 D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
30
- 31 E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper
32 alignment. Bevel edges while asphalt is still hot; compact thoroughly.
33
- 34 F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace
35 with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
36
- 37 G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and
38 hardened.
39
- 40 H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become
41 marked.
42
- 43 3.07 **INSTALLATION TOLERANCES**
44
- 45 A. Pavement Thickness: Compact each course to produce the thickness indicated in the Working
46 Drawings within the following tolerances:
47 1. Base Course: Plus or minus 1/2 inch.
48 2. Surface Course: Plus 1/4 inch, no minus.
49
- 50 B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the
51 following tolerances as determined by using a 10-foot straightedge applied transversely or
52 longitudinally to paved areas:
53 1. Base Course: 1/4 inch.
54 2. Surface Course: 1/8 inch.

- 1 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown.
2 Maximum allowable variance from template is 1/4 inch.

3
4 3.08 PAVEMENT MARKING

- 5
6 A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with
7 Architect.
8
9 B. Allow paving to cure and be dry before starting pavement marking.
10
11 C. Sweep and clean surface to eliminate loose material and dust.
12
13 D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform,
14 straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness
15 of 15 mils.
16 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to
17 pavement surface. Mask an extended area beyond edges of each stencil to prevent paint
18 application beyond stencil. Apply paint so that it cannot run beneath stencil.
19

20 3.09 FIELD QUALITY CONTROL

- 21
22 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
23
24 B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to
25 ASTM D 3549.
26
27 C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance
28 with smoothness tolerances.
29
30 D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted
31 pavement according to ASTM D 979 or AASHTO T 168.
32 1. Reference maximum theoretical density will be determined by averaging results from four
33 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to
34 ASTM D 2041, and compacted according to job-mix specifications.
35 2. In-place density of compacted pavement will be determined by testing core samples
36 according to ASTM D 1188 or ASTM D 2726.
37 a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement,
38 with no fewer than three cores taken.
39 b. Field density of in-place compacted pavement may also be determined by nuclear
40 method according to ASTM D 2950 and correlated with ASTM D 1188 or
41 ASTM D 2726.
42
43 E. Replace and compact hot-mix asphalt where core tests were taken.
44
45 F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate
46 that it does not comply with specified requirements.
47

48 3.010 WASTE HANDLING

- 49
50 A. General: Handle asphalt-paving waste according to approved waste management plan required in
51 Section 01 74 19 "Recycling."
52
53

54
END OF SECTION 32 12 16

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SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Walks.
- B. Related Sections:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for general building applications of concrete.

1.03 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 ACTION SUBMITTALS

- A. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or epoxy adhesive.
 - 7. Joint fillers.

- C. Material Test Reports: For each of the following:
 - 1. Aggregates.

- D. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.
- D. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- E. Preinstallation Conference: Conduct conference at Project site.
 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving subcontractor.

1.07 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.
- C. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

- 1 B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or
2 adversely affect concrete surfaces and that will not impair subsequent treatments of concrete
3 surfaces.
4
- 5 2.02 STEEL REINFORCEMENT
6
- 7 A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not
8 less than 25 percent.
9
- 10 B. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
11
- 12 C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with
13 ASTM A 615/A 615M, Grade 60 deformed bars.
14
- 15 D. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60,
16 plain-steel bars.
17
- 18 E. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
19
- 20 F. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint
21 assembly to hold coupling against paving form and in position during concreting operations, and to
22 permit removal without damage to concrete or hook bolt.
23
- 24 G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening
25 reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports
26 according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of
27 greater compressive strength than concrete specified, and as follows:
28 1. Equip wire bar supports with sand plates or horizontal runners where base material will not
29 support chair legs.
30 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire
31 bar supports.
32
- 33 H. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on
34 reinforcement.
35
- 36 2.03 CONCRETE MATERIALS
37
- 38 A. All concrete shall conform to the Wisconsin Department of Transportation Standard Specifications
39 for Highway and Structures Construction (WisDOT SSHSC), current edition and the City of
40 Madison Specifications for Public Works, Part III, Concrete and Concrete Structures.
41
- 42 B. Cementitious Material: Use the following cementitious materials, of same type, brand, and source
43 throughout Project:
44 1. Portland Cement: ASTM C 150, gray portland cement Type I/II or Type III. Supplement
45 with the following:
46 a. Fly Ash: ASTM C 618, Class C.
47
- 48 C. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single
49 source with documented service-record data of at least 10 years' satisfactory service in similar paving
50 applications and service conditions using similar aggregates and cementitious materials.
51
- 52 D. Maximum Limit of Light Chert: Maximum limit of light chert (specific gravity of 2.40 or less)
53 allowed in coarse aggregate shall be three (3) percent by weight.

- 1
2 E. Water: Potable and complying with ASTM C 94/C 94M.
3
4 F. Air-Entraining Admixture: ASTM C 260.
5
6 G. Chemical Admixtures: Admixtures other than required for air entrainment shall not be used unless
7 approved by the Engineer.
8
- 9 2.04 CURING MATERIALS
- 10
11 A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing
12 approximately 9 oz./sq. yd. dry or cotton mats.
13
14 B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
15
16 C. Water: Potable.
17
18 D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to
19 fresh concrete.
20
21 E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B,
22 dissipating.
23
- 24 2.05 RELATED MATERIALS
- 25
26 A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
27
28 B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid
29 curing and bonding to damp surfaces; of class suitable for application temperature, of grade
30 complying with requirements, and of the following types:
31 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened
32 concrete.
33
- 34 2.06 CONCRETE MIXTURES
- 35
36 A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-
37 weight concrete, and as determined by either laboratory trial mixtures or field experience.
38 1. Use a qualified independent testing agency for preparing and reporting proposed concrete
39 design mixtures for the trial batch method.
40 2. When automatic machine placement is used, determine design mixtures and obtain laboratory
41 test results that meet or exceed requirements.
42
43 B. Proportion mixtures to provide normal-weight concrete with the following properties:
44 1. Minimum cement content shall be six (6) bags per cubic yard, except for concrete mixes with
45 fly ash. Each bag of cement shall contain 94 pounds net.
46 2. Minimum Modulus of Elasticity (28 Days): 3,120,000 pounds per square inch.
47 3. Compressive Strength (28 Days): 3000 psi.
48 4. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
49 5. Slump Limit: No less than 2 inches and no greater than 4 inches.
50
51 C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at
52 point of placement having an air content as follows:
53 1. Air Content: 7 percent air by volume, plus or minus one and one half (1.5) percent.

- 1
2 D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
3
4 2.07 CONCRETE MIXING
5
6 A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to
7 ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
8 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-
9 1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery
10 time to 60 minutes.
11
12 2.08 JOINT SEALANTS
13
14 A. Provide joint sealants in locations indicated and conforming to material requirements as outlined in
15 the City of Madison's Standard Specifications for Public Works Construction, Part III – Concrete
16 and Concrete Structures, Subsection 303.2(d) Joints.
17
18
19 PART 3 - EXECUTION
20
21 3.01 EXAMINATION
22
23 A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional,
24 grading, and elevation tolerances.
25
26 B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of
27 excess yielding.
28 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit
29 vehicle speed to 3 mph.
30 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing
31 not less than 15 tons.
32 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch
33 according to requirements in Section 312000 "Earth Moving."
34 4. Refer to Section 1, Site Preparation of the Project Geotechnical Report for additional
35 information and direction on correcting soft/yielding areas.
36 5. Due to the nature of the existing clay subsoils, significant undercutting and stabilization may
37 be required during site preparation for pavements.
38
39 C. Proceed with installation only after unsatisfactory conditions have been corrected.
40
41 3.02 PREPARATION
42
43 A. Remove loose material from compacted subbase surface immediately before placing concrete.
44
45 3.03 EDGE FORMS AND SCREED CONSTRUCTION
46
47 A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines,
48 grades, and elevations. Install forms to allow continuous progress of work and so forms can remain
49 in place at least 24 hours after concrete placement.
50
51 B. Clean forms after each use and coat with form-release agent to ensure separation from concrete
52 without damage.
53

- 1 3.04 STEEL REINFORCEMENT
2
3 A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting
4 reinforcement.
5
6 B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
7
8 C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during
9 concrete placement. Maintain minimum cover to reinforcement.
10
11 D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one
12 full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in
13 either direction.
14
15 E. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated
16 reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to
17 ASTM D 3963/D 3963M.
18
- 19 3.05 JOINTS
20
21 A. Construct joints in locations indicated in the Working Drawings or, if no layout is specified in
22 Drawings, in conformance with the location and layout requirements in the City of Madison's
23 Standard Specifications for Public Works Construction, Part III – Concrete and Concrete Structures,
24 Subsection 303.2(d) Joints.
25
- 26 3.06 CONCRETE PLACEMENT
27
28 A. Before placing concrete, inspect and complete formwork installation and items to be embedded or
29 cast-in.
30
31 B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on
32 frozen surfaces.
33
34 C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place
35 concrete around manholes or other structures until they are at required finish elevation and
36 alignment.
37
38 D. Comply with ACI 30 requirements for measuring, mixing, transporting, and placing concrete.
39
40 E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete
41 after testing.
42
43 F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or
44 drag concrete into place or use vibrators to move concrete into place.
45
46 G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by
47 hand spading, rodding, or tamping.
48
49 H. Screed paving surface with a straightedge and strike off.
50
51 I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface
52 plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete
53 surfaces before beginning finishing operations or spreading surface treatments.

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- J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

- K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium- Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.08 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- B. Comply with ACI 306.1 for cold-weather protection.

- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

- E. Curing Methods: Cure concrete by a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

1 c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces
2 and edges with 12-inch lap over adjacent absorptive covers.
3

4 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover,
5 placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed
6 by waterproof tape or adhesive. Immediately repair any holes or tears occurring during
7 installation or curing period using cover material and waterproof tape.

8 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller
9 according to manufacturer's written instructions. Recoat areas that have been subjected to
10 heavy rainfall within three hours after initial application. Maintain continuity of coating, and
11 repair damage during curing period.
12

13 3.09 PAVING TOLERANCES

14
15 A. Comply with tolerances in ACI 117 and as follows:

16 1. Elevation: 3/4 inch.

17 2. Thickness: Plus 3/8 inch, minus 1/4 inch.

18 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/2 inch.

19 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12
20 inches of tie bar.

21 5. Lateral Alignment and Spacing of Dowels: 1 inch.

22 6. Vertical Alignment of Dowels: 1/4 inch.

23 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12
24 inches of dowel.

25 8. Joint Spacing: 3 inches.

26 9. Contraction Joint Depth: Plus 1/4 inch, no minus.

27 10. Joint Width: Plus 1/8 inch, no minus.
28

29 3.010 FIELD QUALITY CONTROL

30
31 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
32

33 B. Testing Services: Testing of composite samples of fresh concrete obtained according to
34 ASTM C 172 shall be performed according to the following requirements:

35 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction
36 thereof of each concrete mixture placed each day.

37 a. When frequency of testing will provide fewer than five compressive-strength tests for
38 each concrete mixture, testing shall be conducted from at least five randomly selected
39 batches or from each batch if fewer than five are used.
40

41 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but
42 not less than one test for each day's pour of each concrete mixture. Perform additional tests
43 when concrete consistency appears to change.

44 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less
45 than one test for each day's pour of each concrete mixture.

46 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40
47 deg F and below and when it is 80 deg F and above, and one test for each composite sample.

48 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three
49 standard cylinder specimens for each composite sample.

50 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two
51 specimens at 28 days.

52 a. A compressive-strength test shall be the average compressive strength from two
53 specimens obtained from same composite sample and tested at 28 days.

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- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.011 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

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SECTION 32 36 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

- A. This Section includes the following:

1. Bicycle racks.

- B. Related Sections include the following:

1. Division 32 Section "Concrete Paving" for installation of site concrete.

1.03 SUBMITTALS

- A. Product Data: Provide product data sheet for each type of pre-manufactured product indicated, including manufacturer. Owner's Representative shall review and approve all product data before Contractor places material orders:

1. Bicycle Racks.

2. Any and all other pre-manufactured site furnishings.

- B. Maintenance Data: For all site furnishings to include in maintenance manuals.

- C. Samples: Contractor shall provide the following samples for approval:

1. Powdercoat color samples for each furnishing applicable. Samples shall be physical examples of the color selection, NOT printed color swatches.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

- B. Installer Qualification: An experienced installer who has completed projects with similar materials, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, stairs, ramps, pavements and other construction by field measurements before ordering or fabricating site furnishings.

1.06 COORDINATION

- A. Coordinate installation of all site furnishings with all other applicable pavements and surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- 1 A. Bicycle Racks: Furnish and install bicycle racks as shown in Working Drawings and as herein provided:
2 1. Basis of Design: The work shall include pre-drilling for installation, delivery to project site,
3 providing all hardware necessary for installation, and installation on-site. All racks shall be free of
4 surface blemishes at the time of substantial completion.
5 2. Model: Saris, City Rack
6 a. Or approved equal.
7
8 3. Finish: Powder Coat
9 4. Mounting: Flange Mount
10 5. Provide bike racks in quantities and locations as indicated on drawings. Install and anchor to
11 concrete per manufacturer's specifications.
12

13 2.2 MISCELLANEOUS MATERIALS

- 14
15 A. Repair Paint: Manufacturer's recommended repair paint to repair any damages to exterior finishes.
16
17 B. Concrete Materials and Properties: Comply with requirements in Division 32 Section "Concrete Paving"
18 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of
19 3000 psi, unless otherwise indicated.
20
21

22 PART 3 - EXECUTION

23
24 3.1 EXAMINATION

- 25
26 A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and
27 level finished grade, mounting surfaces, installation tolerances, and other conditions affecting
28 performance.
29 1. Proceed with installation only after unsatisfactory conditions have been corrected.
30

31 3.2 INSTALLATION, GENERAL

- 32
33 A. Comply with manufacturer's written installation instructions unless more stringent requirements are
34 indicated. Complete field assembly of site furnishings where required.
35
36 B. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
37

38 3.3 PROTECTION AND REPAIR

- 39
40 A. Any and all damage to site furnishings shall be reviewed by Owner's Representative and Owner's Project
41 Representative to determine whether field repairs can be performed sufficiently to correct the damage or
42 whether the furnishing shall be removed and replaced. Contractor is responsible for removal and
43 replacement of any and all furnishings deemed to be damaged beyond repair at no additional cost to the
44 Owner.
45

46 3.4 ADJUSTING AND CLEANING

- 47
48 A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair
49 damaged finishes to match original finish or replace component.
50

51
END OF SECTION

SECTION 32 93 00

PLANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern all work under this section.

1.02 SUMMARY

A. Section Includes:

1. Plant Material
2. Mulches
3. Pesticides
4. Miscellaneous Products

B. Related Requirements:

1. Section 32 92 00 "Turf and Grasses" for turf (lawn) planting.

1.03 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

- G. Finish Grade: Elevation of finished surface of planting soil.

- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

- 1 I. Pests: Living organisms that occur where they are not desired or that cause damage to plants,
2 animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers,
3 moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
4
- 5 J. Planting Area: Areas to be planted.
6
- 7 K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with
8 soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See
9 Section 329113 "Soil Preparation" for planting soils.
10
- 11 L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs,
12 vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
13
- 14 M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem
15 or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
16
- 17 N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
18
- 19 O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top
20 surface of a fill or backfill before planting soil is placed.
21
- 22 1.04 COORDINATION
23
- 24 A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are
25 established and before seeding turf areas unless otherwise indicated.
26 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and
27 promptly repair damage caused by planting operations.
28
- 29 1.05 ACTION SUBMITTALS
30
- 31 A. Product Data: For each type of product.
32 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
33
- 34 1.06 INFORMATIONAL SUBMITTALS
35
- 36 A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer
37 demonstrating Installer's capabilities and experience. Include project names, addresses, and year
38 completed, and include names and addresses of owners' contact persons.
39
- 40 B. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to
41 Project.
42
- 43 1.07 QUALITY ASSURANCE
44
- 45 A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful
46 establishment of plants.
47 1. Professional Membership: Installer shall be a member in good standing of either the
48 Professional Landcare Network or the American Nursery and Landscape Association.
49 2. Experience: Five years' experience in landscape.
50 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time
51 supervisor on Project site when work is in progress.
52 4. Pesticide Applicator: State licensed, commercial.
53

- 1 B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable
2 requirements in ANSI Z60.1.
3
- 4 C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
5 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take
6 height measurements from or near the top of the root flare for field-grown stock and
7 container-grown stock. Measure main body of tree or shrub for height and spread; do not
8 measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare
9 for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
10 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
11
- 12 D. Plant Material Observation: Architect may observe plant material either at place of growth or at site
13 before planting for compliance with requirements for genus, species, variety, cultivar, size, and
14 quality. Architect may also observe trees and shrubs further for size and condition of balls and root
15 systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or
16 defective material at any time during progress of work. Remove rejected trees or shrubs immediately
17 from Project site.
18 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.
19
- 20 E. Discrepancies:
21 1. If discrepancies occur between the written Plant List, Plant Schedule, and/or Plant Palette
22 and the actual plant count from the planting symbols on the plans in the Working Drawing
23 set the plans shall govern over the written list.
24
- 25 1.08 SUBSTITUTIONS
26
- 27 A. The substitution of plant material is not permitted unless authorized in writing by the Landscape
28 Architect. If written proof is submitted by the Contractor that the plant of the specified species,
29 variety, or size is unavailable, consideration will be given towards the nearest available size or
30 variety, or towards an alternate species selection, with a corresponding adjustment of the contract
31 price.
32
- 33 B. Larger plants that those specified can be used upon approval of the Landscape Architect or Owner's
34 Project Representative. The use of larger plants shall not increase the contract price. The root ball,
35 root spread and container size of the larger specimen shall be proportionally increased, relative to the
36 specified size.
37
- 38 1.09 DELIVERY, STORAGE, AND HANDLING
39
- 40 A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight,
41 certified analysis, name and address of manufacturer, and indication of compliance with state and
42 Federal laws if applicable.
43
- 44 B. Bulk Materials:
45 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on
46 existing turf areas or plants.
47 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials;
48 discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water
49 conveyance systems, or walkways.
50 3. Accompany each delivery of bulk materials with appropriate certificates.
51
- 52
- 53 C. Handle planting stock by root ball.
54

- 1 D. Deliver plants after preparations for planting have been completed, and install immediately. If
2 planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect
3 (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
4 1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two
5 hours. Reject plants with dry roots.
6 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable
7 material.
8 3. Do not remove container-grown stock from containers before time of planting.
9 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray.
10 Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

11
12 1.010 FIELD CONDITIONS

- 13
14 A. Field Measurements: Verify actual grade elevations, service and utility locations and dimensions of
15 plantings and construction contiguous with new plantings by field measurements before proceeding
16 with planting work.
17
18 B. Planting Restrictions: Planting of perennials shall be completed by October 15.
19
20 C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions
21 permit planting to be performed when beneficial and optimum results may be obtained. Apply
22 products during favorable weather conditions according to manufacturer's written instructions and
23 warranty requirements.
24
25 D. Contractor shall protect all plants, lawns, and grass areas from damage at all times. Damaged plants,
26 lawns or grass areas shall be replaced or treated as required to conform to specifications herein for
27 fresh stock. Work area shall be kept clean and orderly during the installation period. Under no
28 condition shall debris from planting activities result in a safety hazard on-site or to adjacent off-site
29 property. Damage to lawns or grass areas incurred as a result of planting or replacement operations
30 shall be repaired by the Contractor that causes the damage at no cost to the Owner.

31
32 1.011 WARRANTY

- 33
34 A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials,
35 workmanship, or growth within specified warranty period.
36 1. Failures include, but are not limited to, the following:
37 a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of
38 adequate maintenance, or neglect by Owner.
39 b. Structural failures including plantings falling or blowing over.
40 c. Faulty performance of edgings.
41 d. Deterioration of metals, metal finishes, and other materials beyond normal
42 weathering.
43
44 2. Warranty Periods: From date of planting completion.
45 a. Ornamental Grasses: **12 months**.
46
47 3.
48 4. Include the following remedial actions as a minimum:
49 a. Immediately remove dead plants and replace unless required to plant in the
50 succeeding planting season.
51 b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end
52 of warranty period.
53 c. A limit of one replacement of each plant is required except for losses or replacements
due to failure to comply with requirements.

1 d. Provide extended warranty for period equal to original warranty period, for replaced
2 plant material.
3
4

5 PART 2 - PRODUCTS
6

7 2.01 PLANT MATERIAL
8

9 A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing,
10 and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings
11 and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root
12 pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf
13 and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and
14 disfigurement.

15 1. Collected Stock: Do not use plants harvested from the wild, from native stands, from an
16 established landscape planting, or not grown in a nursery unless otherwise indicated.
17

18 B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and
19 form of plants required. Plants of a larger size may be used if acceptable to Architect, with a
20 proportionate increase in size of roots or balls.
21

22 C. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for
23 uniform height and spread, and number the labels to assure symmetry in planting.
24

25 2.02 MULCHES
26

27 A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of shrubs, consisting
28 of one of the following:

- 29 1. Type: Shredded hardwood bark mulch.
30 2. Size Range: 3 inches maximum, 1/2 inch minimum.
31 3. Color: Natural.
32

33 2.03 PESTICIDES
34

35 A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction,
36 and of type recommended by manufacturer for each specific problem and as required for Project
37 conditions and application. Do not use restricted pesticides unless authorized in writing by
38 authorities having jurisdiction.
39

40 B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or
41 growth of weeds within planted areas at the soil level directly below the mulch layer.
42

43 C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that
44 has already germinated.
45

46 2.04 MISCELLANEOUS PRODUCTS
47

48 A. Antidesiccant: Deliver in original, sealed, and fully labeled containers and mix according to
49 manufacturer's written instructions.
50

51 B. Burlap: Non-synthetic, biodegradable.
52
53

1 PART 3 - EXECUTION

2
3 3.01 EXAMINATION

- 4
5 A. Examine areas to receive plants, with Installer present, for compliance with requirements and
6 conditions affecting installation and performance of the Work.
7 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete
8 slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner,
9 turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
10 2. Verify that plants and vehicles loaded with plants can travel to planting locations with
11 adequate overhead clearance.
12 3. Suspend planting operations during periods of excessive soil moisture until the moisture
13 content reaches acceptable levels to attain the required results.
14 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
15
16 B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area,
17 remove the soil and contamination as directed by Architect and replace with new planting soil.
18
19 C. Proceed with installation only after unsatisfactory conditions have been corrected.
20

21 3.02 PREPARATION

- 22
23 A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing
24 plants from damage caused by planting operations.
25

26 3.03 EXAMINATION

- 27 A. Examine areas to receive plants for compliance with requirements and conditions affecting
28 installation and performance.
29 1. It is the responsibility of the Landscape Contractor to verify that sufficient Planting Soil has
30 been provided both in terms of quality and quantity (depths) as indicated in Section 32 91 13
31 "Soil Preparation". If insufficiencies in planting soil occur, Landscape Contractor shall
32 notify Landscape Architect and General Contractor immediately and shall not begin any
33 planting operations until any and all unsatisfactory conditions have been corrected.
34 2. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete
35 slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner,
36 turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
37 3. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
38
39 B. Proceed with installation only after unsatisfactory conditions have been corrected.
40
41 C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area,
42 remove the soil and contamination as directed and replace with new planting soil.
43

44 3.04 PLANTING AREA MULCHING

- 45
46 A. Mulch backfilled surfaces of planting areas and other areas indicated.
47 1. Organic Mulch: Apply shredded hardwood bark mulch over surfaces of at-grade planting
48 beds as indicated in Working Drawings and finish to 1" below any adjacent pavement
49 surfaces.
50 2. Separate mulched areas from turf areas with a 45-degree, 4 to 6-inch deep, shovel-cut edge.
51

52 3.05 PLANT MAINTENANCE

- 1 A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring
2 planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or
3 vertical position, and performing other operations as required to establish healthy, viable plantings.
4
5 B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace
6 mulch materials damaged or lost in areas of subsidence.
7
8 C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and
9 pathogens or disease. Use integrated pest management practices when possible to minimize use of
10 pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage,
11 mechanical controls such as traps, and biological control agents.
12
13 3.06 PESTICIDE APPLICATION
14
15 A. Apply pesticides and other chemical products and biological control agents according to authorities
16 having jurisdiction and manufacturer's written recommendations. Coordinate applications with
17 Owner's operations and others in proximity to the Work. Notify Owner before each application is
18 performed.
19 B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to ground-cover areas according to
20 manufacturer's written recommendations. Do not apply to seeded areas.
21 C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-
22 germinated weeds and according to manufacturer's written recommendations.
23
24 3.07 REPAIR AND REPLACEMENT
25
26 A. General: Repair or replace existing trees and other plants that are damaged by construction
27 operations, in a manner approved by Architect.
28 1. Submit details of proposed pruning and repairs.
29 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
30 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as
31 determined by Architect.
32
33 B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the
34 end of the corrections period or are damaged during construction operations that Architect
35 determines are incapable of restoring to normal growth pattern.
36 1. Provide new trees of same size as those being replaced for each tree.
37
38 3.08 CLEANING AND PROTECTION
39
40 A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
41 Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved
42 areas.
43
44 B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris
45 and legally dispose of them off Owner's property.
46
47 C. Protect plants from damage due to landscape operations and operations of other contractors and
48 trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace
49 damaged plantings.
50
51 D. After installation, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris
52 from plant material, planting areas, and Project site.
53

- 1 3.09 MAINTENANCE SERVICE
2
3 A. Maintenance Service for Plants: Provide maintenance by skilled employees of landscape Installer.
4 Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are
5 installed and continue until plantings are acceptably healthy and well established, but for not less
6 than maintenance period below:
7 1. Maintenance Period: Two months from date of planting completion. Coordinate maintenance
8 period with maintenance period for lawns so they're contiguous.
9

10
11 END OF SECTION 32 93 00