PUBLIC HEALTH OFFICE REMODEL

Construction Document Set

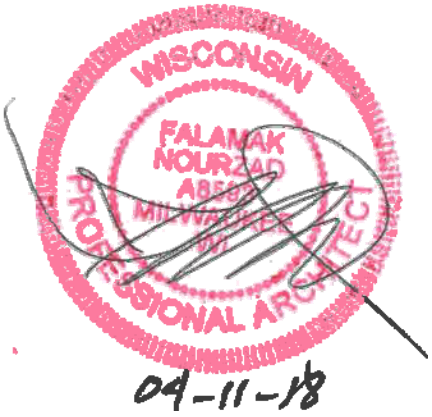
210 Martin Luther King Jr. Blvd.
Madison, Wisconsin 53703

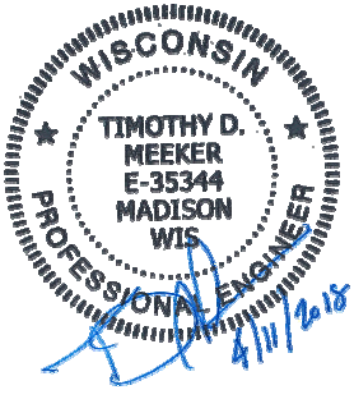
MUNIS No: 17047
Contract No. 8182
CAP Project No. 170803
April 11, 2018

PROJECT MANUAL

ARCHITECT
Continuum Architects + Planners, S.C.
207 E. Michigan St, Suite 400
Milwaukee, WI 53202

MEP Engineer
JDR Engineering, Inc.
5525 Nobel Drive, Suite 110
Madison, WI 53711





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SECTION 00 31 46
PERMITS

PART 1 – GENERAL

1.1. SUMMARY

A. Each project has varying requirements for permits, inspections, and fees based on the scope, size, and location of the project.

B. The City of Madison (Owner) is subject to all permits, inspections and associated fees for construction, demolition, utility connection, storm water management, and other similar requirements that may be required to complete the scope of work associated with these contract documents.

C. The General Contractor (GC) shall be responsible for applying for all required permits and inspections necessary to complete this contract.

D. The Owner, represented by the City Project Manager (CPM) or City Construction Manager (CCM) shall be responsible paying for all application and inspection fees that may be required.

1.2. REFERENCES

A. The following references are not intended to be all inclusive. It shall be the GC's responsibility to determine all requirements based on the scope of work in the contract documents.

B. City of Madison Ordinances: Review all ordinances that may require a permit or fee that may be connected with a required permit. **Contact the following City Agencies to determine the exact requirements during bidding**

1. Building Inspection
2. Zoning
3. Engineering
4. Water Utility
5. Traffic Engineering
6. Others as may be specified by the contract documents.

B. State Statutes

C. Other Regulatory Regulations

D. Other Agencies or companies that may have related requirements

1. Madison Metropolitan Sewerage District
2. Local gas and electric utility companies
3. Other utility companies

1.3. GENERAL CONTRACTORS RESPONSIBILITIES

A. The GC shall submit applications for all required permits as may be required by the scope of work described within the contract documents. This includes but is not limited to permits to connect storm, sanitary and water; land disturbing permits; occupation of right-of-way permits; hazardous waste removal permits; and other related city, county, state, or federally required permit.

B. The GC shall be responsible for all applications, fees, and connection coordination, with private utility companies including but not limited to electric, gas, cable, phone, etc. as may be required for this project.

C. The GC shall schedule all required inspections that may be conditions of any required permits regardless of origin.

D. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the Contract Documents-Regulatory Documents Library on the Project Management Web Site.

1.4 OWNER RESPONSIBILITIES

A. The Owner, represented by the CPM or CCM, shall be responsible for all of the following:

1. Working with Engineering Accounting Team to obtain required Tyler Cashiering Codes for paying fees through interagency billing.

2. Working with Engineering Accounting Team to obtain required City checks for paying fees to non-city agencies.
3. Working with other City Staff and the Engineering Accounting Team as needed to pay for fees that may be received through invoices from other non-city agencies.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

SECTION 00 43 43
WAGE RATES FORM

PART 1 – GENERAL

1.1. SUMMARY

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

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

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

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

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

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

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

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

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

Reimbursable Hourly Rate Worksheet

(see bottm of page for instructions)

Project Name:

Project Location:

Project Number:

Contractor:

Rates are based on the following documentaton:

Enter TRADE Here:

Carpenter

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

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

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

Form Instructions:

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

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

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

END OF SECTION

SECTION 00 62 76.13
SALES TAX FORM

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATION SECTIONS

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

1. Use the following link to access the Standard Specifications web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison Standard Specification **2**10.2" click the link for Part II, the Part II PDF will open.
   b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.

1.3. TAX EXEMPT FORM

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

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

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

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

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

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

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

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

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

3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT

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

B. The GC shall submit a substitution request using the digital form on the Project Management Web Site (SharePoint) located in the Construction Administration-Substitution Request library.
   1. Click on *Add document* to open a new digital form, fill out form, provide required attachments, then click the Submit button.
   2. Consulting Staff, Owner and Owners Representatives will review the request and provide the appropriate approvals and feed back to the GC.

3.3. UNAUTHORIZED SUBSTITUTIONS

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

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

1

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

Substitution Request

Today's Date:

Project Title:

Project Number: *Contract Number:*

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

1. The General Contractor affirms that this request is in compliance with the requirements described in ***Specification 01 25 13 Product Substitution Procedures***.
2. The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.
3. The proposed substitution does not affect dimensions shown on the drawings.
4. The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.
5. Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)
6. The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not to limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.

GC Substitution Request:

General Title:

Related Specification:

Reason for Substitution:

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

Submitted By: *Phone:*

Company: *Email:*

2
3
4
5
6
7 **END OF SECTION**
8
9

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SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)

PART 1 – GENERAL

1.1. SUMMARY

A. Contractors shall use the RFI form/process to request additional information or clarification regarding the construction documents.

B. All RFI documentation will be processed through the Construction Administration-Request for Information Library on the Project Management Web Site (SharePoint).

1.2. RELATED SPECIFICATIONS

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

1.3. PERFORMANCE REQUIREMENTS

A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
   1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.

B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one RFI shall be allowed and responded to.

1.4. QUALITY ASSURANCE

A. The GC shall be responsible for all of the following:
   1. Ensure that any request for additional information is valid and the information being requested is not addressed in the construction documents.
   2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
   3. Ensure that all Work associated with an RFI response is carried out as intended.

B. The PA shall be responsible for the following:
   1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
      a. The CPM, Owner, consulting staff, and other City staff shall be responsible for the initial review of the RFI. The PA shall be responsible for codifying all consultant and Owner/City staff comments into a unified RFI response.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. HOW TO INITIATE AN RFI

A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents any contractor may initiate an RFI for additional information or clarification through the GC.

B. The GC shall initiate an RFI form in the Construction Administration - Request for Information Library on the Project Management Web Site (SharePoint).
   1. The GC shall select the “Add Document” link in the RFI Library and completely fill out the form as follows:
      a. Contract related information is automatically populated on the form when it is initiated.

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

2. Check all relevant boxes for trades affected. This will assist the design team in determining who should be reviewing the RFI.
3. Upon completing the RFI click the "Submit" button. The SharePoint software will automatically route the RFI to the appropriate reviewers.

3.3. RFI RESPONSES

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

3.4. COMMENCEMENT OF WORK RELATED TO AN RFI

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

END OF SECTION

SECTION 01 26 46
CONSTRUCTION BULLETIN (CB)

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

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

1.2. RELATED SPECIFICATIONS

A. Section 01 26 13 Request for Information (RFI)
B. Section 01 26 57 Change Order Request (COR)
C. Section 01 26 63 Change Order (CO)
D. Section 01 31 23 Project Management Web Site (SharePoint)

1.3. PERFORMANCE REQUIREMENTS

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

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

1.4. QUALITY ASSURANCE

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

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. WRITING THE CONSTRUCTION BULLETIN

A. The CB form is located in the Construction Administration - Construction Bulletin Library on the Project Management Web Site (SharePoint). The PA shall initiate the form as indicated in the execution section below.

B. The PA shall select the "Add Document" link in the CB Library

B. The PA shall draft a CB as needed using the Construction Bulletin form in SharePoint.

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

B. Once the final CB has been approved the PA shall "Submit" the CB through the SharePoint to the GC.

3.2. EXECUTING THE CONSTRUCTION BULLETIN

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

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

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

END OF SECTION

SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)

PART 1 – GENERAL

1.1. SUMMARY

A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made by the General Contractor (GC) without having prior approval of the City Engineer or his representative.
   1. For the purposes of this contract the only approved representatives of the City Engineer shall be the City Project Manager (CPM) and the City Construction Manager (CCM) assigned to this project.
   2. The GC shall verify with the CPM or CCM requests for changes in the Work from any other source before proceeding with Change Order Requests and Change Orders.

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

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

D. Where changes in the Work are made by the City through use of a force account basis, the GC shall as soon as practicable, and in no case later than ten (10) working days from the receipt of such order, unless another time period has been agreed to by both parties, give the City written Notice, stating:
   1. The date, circumstances and source of the extra work; and,
   2. The cost of performing extra work described by such Order, if any; and,
   3. Effect of the order on the required completion date of the Project, if any.

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

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

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

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

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

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

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 26 13 Request for Information (RFI)

B. Section 01 26 46 Construction Bulletins (CB)

C. Section 01 26 63 Change Order (CO)

D. Section 01 31 23 Project Management Web Site (SharePoint)

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

1. Use the following link to access the Standard Specifications web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example, if the specification says "Refer to City of Madison Standard Specification **2**10.2" click the link for Part II, the Part II PDF will open.
   b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.

1.3. DEFINITIONS AND STANDARDS

A. The City of Madison is a Tax Exempt Municipality. No contractor shall charge sales or other tax on any materials purchased for this project. See specification 00 62 76.13 Sales Tax Form for more information.

B. LABOR: The amount of time and cost associated with the performance of human effort for a defined scope of Work. Labor is further defined as follows:

1. Labor rate is the total hourly rate which includes the basic rate of pay, fringe benefits plus each company's cost of required insurance, also referred to as a reimbursable labor rate.
2. Unit labor is the labor hours anticipated to install the corresponding unit of material.
3. Labor cost is the labor hours multiplied by the hourly labor rates.

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

D. LARGE TOOLS AND MAJOR EQUIPMENT: Large tools and major equipment are those with an initial cost greater than $1,500, whether from the GC or other sources.

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

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

F. SUB-CONTRACTOR COSTS: Sub-contractor costs are for those labor, material, and equipment costs required by subcontracted specialties to complete the Change Order work including allowable markups as outlined within this specification.

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

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

1.4. CONTRACT EXTENSION

A. The GC shall not assume that every COR will require a Contract Extension. If the GC feels a contract extension is warranted, he/she shall provide sufficient scheduling information that shows how the COR being requested impacts the critical path of the project.

B. The City of Madison strongly encourages the GC to explore alternative methods and practices prior to submitting a COR with a request for contract extension.

1.5. OVERHEAD AND PROFIT MARKUP

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

1.6. PERFORMANCE REQUIREMENTS

A. The GC shall become thoroughly familiar with this specification as it will identify procedures and expenses that are or are not allowed under the Change Order and Change Order Request process.

B. The GC shall be responsible for all of the following:
   1. Carefully reviewing the CB that is associated with the COR.
   2. Collecting required supporting documentation from all contractors that quantify the need for a COR.
      a. Labor hours
      b. Labor rates
         i. Labor rates as defined by Section 1.3(A)(1) above shall be submitted with supporting documentation on the City's Reimbursable Labor Rate form prior to submitting any change Order Requests.
      c. Material costs

d. Equipment costs

C. The following shall apply to establishing prices for labor, materials, and equipment costs:
1. Where Work to be completed has previously been established by individual bid items in the contract bid proposal the GC shall use the unit bid prices previously established.
2. Where Work to be completed was bid as a Lump Sum without individual bid items the GC shall provide a breakdown of all labor, materials, equipment including unit rates and quantities required.

D. The completion date is determined by Owner. The schedule, however, is the responsibility of the GC. Time extensions for extra Work will be considered when a schedule analysis of the critical path shows that the Change Order Request places the Work beyond the completion date stated in the Contract.

1.7. QUALITY ASSURANCE

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

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. ESTABLISHING A CHANGE ORDER REQUEST

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

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

3.2. SUBMIT A CHANGE ORDER REQUEST FORM

A. Submit a COR only for Work related to a specific RFI or CB item. DO NOT combine multiple RFI or CB items into the same COR.
1. Example; If a CB item is to move a wall and it affects plumbing, heating, electrical, and framing provide all of the information necessary for this item but do not include information for a CB item that modifies the parking lot.

B. The GC shall initiate a COR form in the Construction Administration – Change Order Request Library on the Project Management Web Site (SharePoint) by clicking the "Add Document" link in the COR Library and completely filling out the form as follows:
1. Provide only the following general information at the top of the form. All other information including calculations is automatically populated.
a. Identify the document source this COR is related to.
b. Check if a Contract Extension is required.
c. Provide a brief description of this COR.
d. Add back up documentation as attachments as needed:
i. The City provided *COR Quote Worksheet* is required for each COR.
- The GC is required to provide an all-inclusive summary worksheet of the COR.
- The GC is required to provide a separate worksheet for any self-performed work.
- The GC is required to provide separate worksheets for each subcontractor whose scope of work is contained in the change order request.

- No worksheets shall include sales tax, supervision, or markup of any kind.

2. Section A self populates based on other areas from the form. DO NOT attempt to edit these fields.
3. Section B is for General Contractor Self Performed Work.
    a. Only provide Labor, Material, and Large Tool Equipment Costs.
        i. DO NOT include any markup as the form will do that for you.
4. Section C self populates based on other areas from the form. DO NOT attempt to edit these fields.
5. Section D provide Sub Contractor name, labor, material, and large tool/equipment costs as follows:
    a. Select the Sub-contractor company name from the drop down list
    b. Only provide Labor, Material, and Large Tool Equipment Costs for this contractor.
        i. DO NOT include any markup as the form will do that for you.
    c. Add additional Sub-contractors as needed and repeat 5a & 5b above for each.
6. After completely filling out the form as noted above the GC shall:
    a. Verify that the form has completed all applicable calculations.
    b. Notify the CPM/CCM if you suspect any errors.
    c. Click on the "GC Submit COR" button. This will kick off the COR Review and Approval process

3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING

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

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

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

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

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

3.4. EMERGENCY CHANGE ORDER REQUEST

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

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

END OF SECTION

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SECTION 01 26 63
CHANGE ORDER (CO)

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. BOARD OF PUBLIC WORKS PROCEDURE

A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders associated with any Public Works Contract as follows:
   1. The Supervisory Chain of the CPM/CCM shall review and approve any CO under $20,000 provided it does not include either of the following:
      a. The CO does not request a time extension to the contract.
      b. The CO does not cause the contract contingency sum to be exceeded.
   2. The Board of Public Works shall review and approve any CO that requires any of the following:
      a. Any CO over $20,000.
      b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
      c. Any CO that that causes the contract contingency sum to be exceeded.

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

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

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. PREPARATION OF THE CHANGE ORDER

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

3.2. ROUTING OF THE CHANGE ORDER

A. Upon completing the CO form and Justification form the CPM/CCM shall save the form and click the Submit to GC button. The SharePoint software will send email notification to the GC that a CO is available for his/her review and signature.

B. Upon receiving the email notification the GC shall review the CO in SharePoint
   1. The GC shall notify the CPM/CCM immediately of any errors or discrepancies on the form and shall not sign or save it.
      a. The CPM/CCM shall make any corrections as needed, re-save the form, and notify the GC.
   2. If/when the GC concurs with the CO form as drafted the GC shall digitally sign and date the form and click the Save Signature button. The SharePoint software will send email notification to the next routing position for review and signature.

C. Each routing location shall review and digitally sign and date the form and SharePoint will continue to send routing emails until all required signatures are completed.

3.3. MONITORING THE CHANGE ORDER ROUTING

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

B. Ensure that the Sharepoint software is indicating that the CO is complete in the SharePoint library.

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATIONS

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

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

1. Use the following link to access the Standard Specifications web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison Standard Specification **2**10.2" click the link for Part II, the Part II PDF will open.
   b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.

1.3. RELATED DOCUMENTS

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

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

1.4. BASIS OF VALUES

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT

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

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

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

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

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

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

3.2. AIA DOCUMENT G703 – CONTINUATION SHEET

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

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

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

3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL

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

B. The PA, CPM, and CCM shall review the SOV as any other submittal and may require modifications to reflect additional detail as necessary.

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

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

3.4. SOV FOR PROGRESS PAYMENT REQUESTS

A. The Contractor shall update the SOVs with each Progress Payment Application as follows:
   1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of Values submittal has been approved.
   2. Change orders shall be added as additional items and values at the bottom of the SOV as they become approved and posted to the City's contract worksheet. The value for each change order shall be the value indicated on the SOV and shall stand alone. Values shall not be split out or combined with other existing items with similar work descriptions on the original SOV.
      a. I.E. DO NOT split out costs for plumbing, heating, etc. and put them into separate categories or combine them into the original SOV totals
   3. Fill out Columns D, E, F and G to properly reflect the work completed and materials received since the last Progress Payment Application.
   4. Only materials delivered and stored on the project site may be reflected on SOV progress updates.

B. Provide updated G702 and G703 sheets with each Progress Payment application.

C. See Specification 01 29 76 Progress Payment Procedures for additional information on submitting Progress Payment Applications.

END OF SECTION

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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.1. SUMMARY

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

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

C. The Project Architect (PA) and the City Project Manager (CPM) or the City Construction Manager (CCM) shall review and amend or approve the PP on the SharePoint.

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

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

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

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

1.4. PROGRESS PAYMENT MILESTONES

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

B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment requests and contract closeout requests. Missing, incomplete, or incorrect documentation for any agency may be a cause for not processing progress payments. It shall be the sole responsibility of the Contractor for providing documentation as required or requested to the appropriate agencies.

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

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

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

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
BPW Contract Administration Documentation • Workforce profiles • Best Value Contracting Documentation • Sub-contractors prequalification approval & Affirmative Action plans • Other as may be required	PP-1, or start work as applicable	• For GC and Sub-contractors before PP-1 regardless of scheduling • Sub-contractors (if applicable), due 10 days before they may start work • Sub-contractors (if applicable), due 10 days before they may start work
Required Administrative Submittals • Wage Rates Form • Contractors Project Directory • Schedule of Values • Submittals Schedule • Photographic Documentation • Mockups • Testing Laboratory Services • Waste Management Plan • Closeout Requirement Checklist • Operation and Maintenance Data • Warranty Checklist • Spare Parts and Extra Materials • Demonstration and Training	PP-1	References • Specification 00 43 43 • Specification 01 31 23 • Specification 01 29 73 • Specification 01 32 19 • Specificaiton 01 32 33 • Specification 01 43 39 • Specification 01 45 29 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 23 • Specification 01 78 36 • Specification 01 78 43 • Specification 01 79 00
Construction Progress Milestones • Early submittals, per submittal schedule • Detailed Contract Schedules	PP-1	See specifications for specific requirements • Specification 01 32 19, Examples: concrete mix, structural steel, products with long lead times • Specification 01 32 16
General Construction Progress Requirements are all up to date • Progress Schedules • Submittals/Re-submittals (ongoing) • Schedule of Values • Progress Reporting • LEED Documentation • Waste Management documentation • QMOs are being addressed and closed • Progress Cleaning	Each future PP	Verified with each Progress Payment Request • Specification 01 32 16 • Specification 01 33 23 • Specification 01 29 73 • Specifications 01 32 26, 01 32 33 • All specifications with LEED documentation requirements • Specification 01 74 19 • Specification 01 45 16 • Specification 01 74 13

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
• As-Built Drawings		• Specification 01 78 39
*** All of the above are being updated on the Project Management Web Site as required**		
BPW Contract Administration Documentation • Weekly payroll reports • Best Value Contracting Reports • SBE Reports	25% CT or PP 2	See 1.4.E above. *This progress payment will be with held by BPW for any missing contractual documentation.*
Construction Progress Milestones • Construction/Contract Closeout Meeting #1 • Submittals/Re-submittals complete	50% CT	• Specification 01 31 19 • Specification 01 33 23
Operation and Maintenance (O & M) drafts	60% CT	• Specification 01 78 23
Construction/Contract Closeout Meeting #2 • Construction closeout checklist	70% CT	• Specification 01 31 19 • Specification 01 77 00
BPW Contract Administration Documentation • Request Finalization Review from BPW	80% CT	This is a recommendation to the GC and is not a requirement of this PP. • Specification 01 77 00
Construction Progress Milestones • Operation and Maintenance (O & M) finals, accepted • All major QMO issues resolved • As-Built Drawings, Division Trades ready for GC review	80% CT	• Specification 01 78 23 • Specification 01 45 16; Items that could prevent occupancy • Specification 01 78 39
All of the following shall be completed for this PP: • Regulatory Inspections completed • Photographic Documenation completed • All QMO reports closed • Demonstration and Training completed • Attic Stock completed • Final Cleaning	90% CT	Contractor to determine the proper order of completion: • Governing ordinances and statutes • Specification 01 32 33 • Specification 01 45 16 • Specification 01 79 00 • Specification 01 78 43 • Specification 01 74 13
Construction Closeout Procedures: • Letter of Substantial Compliance sent to BI and DHS as needed • Certificate of Occupancy issued • As-Built Drawings, finals, accepted • City Letter of Substantial Completion • Warranty letters dated and issued	100% CT	• Specification 01 77 00 • Generated/Signed by the Architect • Building Inspection • Specification 01 78 39 • Signed by the City Engineer • Specification 01 78 36
*** Completion of this begins the one year warranty.**		
BPW Contract Administration Documentation Contract Closeout Procedures • Construction Closeout has been completed	Final	• Specification 01 77 00

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
• Contractor requests final payment of retainage upon receiving City Letter of Substantial Completion • All BPW contractual requirements are verified		• Contractor must provide any missing BPW Contractual Documentation
*** Completion of this closes the contract but not the warranty period/bond.**		
NOTE: **CT = Contract Total less held retainage**		

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 SharePoint 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/CCM. All of the following conditions must be met to be allowed:
         i. Items must be visually inspected by CPM/CCM 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 and accepted.
   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 - NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR PROCEDURE

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

3. Ensure that any newly posted change orders from the City of Madison provided tabulation sheet have been entered on the G703 continuation sheets. Repeat steps a thru c above for each change order on the schedule of values and the City Tabular Sheet.

B. The GC shall fill out the City of Madison Application and Certificate of Payment cover sheet as follows:
1. The GC shall not change any pre-printed information and shall not write in the box that indicates previous progress payments.
2. The GC shall sign and date the form where indicated.
3. The GC shall provide the dates from and to for the PP being requested.
4. The GC shall provide the list of all contractors/sub-contractors that were actively working during the dates indicated above.
a. All contractors/sub-contractors named must be in compliance with all City requirements (Pre-qualified, Affirmative Action Plan on file, etc). The PP will be held and not processed by the City of Madison until all contractors/sub-contractors are in compliance.
b. Do not list the names of suppliers or manufacturers, doing so will slow down processing and require a re-submittal of the paperwork.

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

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

3.2. PROJECT ARCHITECT PROCEDURE

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

3.3. CITY PROJECT MANAGER PROCEDURE

A. The CPM/CCM shall review all documents submitted by the GC and work with the PA to ensure the schedule of values accurately reflects the work completed to date.
B. The CPM/CCM may elect to hold processing of any progress payment pending submittal of required progress payment milestones.
C. When verified, the CPM/CCM shall digitally sign the City Cover Sheet and forward the required documentation to the appropriate City agencies for further processing of the payment request.
D. The CPM/CCM shall add a scanned copy of any documents indicating the PP request processing was completed to SharePoint.

END OF SECTION

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SECTION 01 31 13
PROJECT COORDINATION

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATIONS

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

1.3. GENERAL REQUIREMENTS

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

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

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

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

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

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

1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS

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

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

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

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

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

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

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

1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS

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

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

1. Perform your work in proper sequence according to the GC's project schedule and in relation to the work of other trades.
2. Notify other sub-contractors and trades whose work may be connected to, combined with, or influenced by your work and allow them reasonable time and access to complete their work.
3. Join your work to the work of others in accordance with the intent of the Contract Documents.
4. Order materials and schedule deliveries to facilitate the general progress of the Work.

C. Cooperate with all other trades to facilitate the general progress of the work. This shall include providing every reasonable opportunity for the installation of work by others and the storage of their materials and equipment.
1. In no case shall any contractor exclude from the premises or work any Sub-contractor or their employees.
2. In no case shall any contractor interfere with the execution or installation of Work by any other Sub-contractor or their employees.

D. Arrange your work, equipment, and materials and dispose of your construction waste so as to not interfere with the work or storage of materials of others.

E. Coordinate all work as indicated during pre-installation meetings with Owner Representatives, the GC and other trades. Any work improperly coordinated shall be relocated as designated by the Owner Representative at no additional cost to the City.

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATIONS

A. 01 31 23 Project Management Web Site (SharePoint)

B. 01 32 16 Construction Progress Schedules

C. 01 43 39 Mockups

D. 01 50 00 Temporary Facilities and controls

1.3. PROJECT MEETING TYPES

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

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

1.4. GENERAL REQUIREMENTS

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

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

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

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

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

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

1. Owner Representative(s)
2. Architect and applicable sub consultant(s)

3. General Contractor and applicable subcontractors and suppliers
4. City Quality Management Staff
5. Commissioning Agent
6. Others, as may be invited for particular agenda items.

E. Topics of the Preconstruction Meeting shall include but not be limited to the following:
1. Staff and contractor introductions
2. Completion Date
3. BPW Administrative requirements and due outs
   a. Small Business Enterprise (SBE) (if applicable)
   b. Certified payroll forms
   c. Workforce profiles
   d. Best Value Contracting (BVC)
4. General Facility Management Division 1 Specifications, including:
   a. Section 01 29 76 Progress Payment Procedures
   b. Section 01 31 23 Project Management Web Site (SharePoint) (overview)
   c. Section 01 45 16 Field Quality Control Procedures
   d. Section 01 77 00 Closeout Procedures
5. Project Meeting scheduling
   a. Section 01 31 19 Project Meetings
6. Construction Schedule

3.2. PROJECT MANAGEMENT WEB SITE (SHAREPOINT) – TUTORIAL MEETING

A. The CPM shall schedule and conduct a tutorial presentation of SharePoint 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 SharePoint system.
D. It is recommended that all contractors bring their lap top, tablet or other internet capable device with them including a fully charged battery and internet connection devices as necessary.

3.3. CONSTRUCTION PROGRESS MEETINGS

A. In general all of the following shall apply:
1. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
2. The attendance shall be from the required attendance list in 3.1.D. above.

B. The General Contractor Project Manager (GCPM) shall:
1. Schedule and conduct all construction progress meetings biweekly or more frequently as required.
   a. For the purposes of this contract the Owner will be providing the meeting spaces as noted in this section.
   b. If the Contractor needs progress meeting more frequently any additional scheduling and organization shall be the responsibility of the Contractor.
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. See item 3.3.B.1.iii above and Specification 01 50 00 Temporary Facilities and Controls for more information and requirements.
4. GCPM to post meeting agendas to the appropriate libraries on the Project Management Web Site (SharePoint) 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 SharePoint no more than two (2) working days after the completed meeting. Meeting

minutes shall include a scanned copy of the attendance sign-in sheet. Notify all required meeting attendees, applicable parties to the contract, and others affected by decisions made at the meetings.

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

3.4. PRE-INSTALLATION MEETINGS

A. The GCPM shall schedule and conduct all pre-installation meetings, including mockup reviews, before each construction activity that requires coordination with other trades.

B. The GCPM shall be responsible for the final agenda and meeting minutes.

C. The GCPM will work with all concerned parties to resolve issues as needed and submit RFI's if necessary.

D. Required attendance shall be from the list in 3.1.D. above and shall be personnel having a stake in the outcome of the installation or knowledge of the system being installed.

E. In the event the Contractor installs equipment or materials without a pre-installation meeting the Contractor shall be solely responsible for removing, replacing, repositioning materials and equipment as instructed by the Project Architect or City Project Manager at no additional cost to the City.

3.6 PRE-CONTRACT CLOSEOUT MEETINGS

A. Two (2) Pre-contract Closeout Meetings shall be held to review the closeout procedures, requirements, and contract deliverables.

1. Pre-contract Closeout Meeting #1 shall be scheduled prior to the 50% Progress Payment Request is being requested. This meeting shall discuss items such as closing out QMO reports, providing O&M drafts and finals, payroll and Affirmative Action documentation, and other contract deliverables.
2. Pre-contract Closeout Meeting #2 shall be scheduled prior to the 80% Progress Payment Request is being requested. This meeting shall discuss, but not be limited to, the status of scheduling final regulatory inspections, cleaning up outstanding QMO's, demonstration and training, attic stock; and finalization review of payroll and other related documents.

B. The GCPM shall schedule, coordinate, and make physical arrangements for both meetings. The GCPM can work with the CPM to see if the owner will have space available to conduct these meetings. Minimum scheduling time with the owner is 4 weeks out from the date needed.

C. All of the following shall be required to attend both meetings:

1. The GCPM and the GC Field superintendent
2. All Subcontractor Project Managers regardless of the current status of their work.
   a. The GCPM may excuse a Subcontractor PM if he is confident that all contractual requirements for closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
   b. At the option of these project managers the field supervisors may also attend.
3. The Project Architect and at least one design consultant from each discipline represented by the plans and specifications to address open QMOs, final tests, reports, etc.
4. The Owner
5. The CPM
6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
7. The Commissioning Agent

D. The CPM shall publish an agenda and chair the meeting.

3.7 OTHER SPECIAL MEETINGS

A. The Contractor shall schedule special meetings per the requirements of the LEED Specification, the Project Quality Management Plan, the Commissioning Plan and as indicated by other specifications.

B. Special meetings include but are not limited to the following:

1. Waste Management Conference
2. Equipment start up meetings
3. Testing and balancing meetings
4. Other meetings as necessitated by the contract documents

END OF SECTION

SECTION 01 31 23
PROJECT MANAGEMENT WEB SITE (SHAREPOINT)

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 SharePoint software has been successfully deployed on several projects, and we continue to modify/update/enhance it on a regular basis.

1.2. SHAREPOINT PROCEDURE OVERVIEW

A. SharePoint 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. Form Libraries are primarily used when a specific work flow process is needed. The form acts as the cover letter. An example of this would be the Submittal Review Process.
3. Data Lists contain consolidated data information that can be generated and stored for other. An example of this would be the Project Directory.
4. All libraries are controlled by Permission Groups and Permission Levels.

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

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

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

E. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related documentation. Prior to setting up the SharePoint Construction Project Web Site for this contract the GC and CPM shall meet to review all SP workflows, the GC will determine to what level over the minimum requirements the SC's will be involved.

F. The figure below shows the general structure of the SharePoint construction documentation categories and the libraries under each category. Related specification numbers are in "( )" if applicable. Not all contractors have access to all libraries. For example, sub-contractors do not have access to the GC Partial Pay Apps library.

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

1.3. RELATED SPECIFICATIONS

A. The following specification sections are directly related to the SharePoint system.

1. 01 25 13 Product Substitution Procedures
2. 01 26 13 Request for Information (RFI)
3. 01 26 46 Construction Bulletins (CB)
4. 01 26 57 Change Order Request (COR)
5. 01 26 63 Change Order (CO)
6. 01 29 76 Progress Payment Procedures
7. 01 31 19 Project Meetings
8. 01 32 16 Construction Progress Schedules
9. 01 32 26 Construction Progress Reporting
10. 01 32 33 Photographic Documentation
11. 01 33 23 Submittals
12. 01 45 16 Field Quality Control Procedures

PART 2 - PRODUCTS

2.1. SHAREPOINT SYSTEM PRODUCT REQUIREMENTS

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

B. Currently the CoM is using SharePoint 2010.
   1. SharePoint works best if the user's computer is running Windows.
      a. SharePoint does work on Apple based computers; see item 2 below for additional information.
      b. SharePoint is not an "APP" therefore it will not work on tablets that only run apps.
   2. SharePoint works best when used with the latest versions of Internet Explorer (32 bit).
      a. At this time SharePoint is not compatible with other internet browsers such as Fire Fox, Google Chrome, and Safari.
      b. Apple computers can download copies of Internet Explorer for free off the internet.

PART 3 - EXECUTION

3.1. AFTER BID OPENING

A. After bids have been opened, are being approved, and the contract is routing for signatures, the City Project Manager (CPM) will contact the GC to provide the following information.
   1. Project Management Software Tutorial. This tutorial is in a PDF printable format with screen shots and associated instructions on how to access and use the PMT.
      a. Tutorial instructions will include but not be limited to the following:
         i. Descriptions of various libraries, documents, and forms that will be used throughout the construction project.
         ii. Uploading procedures for various types of documents including standardized naming conventions.
      b. If needed a tutorial class can be set up for the GC and his/her support staff and all sub-contractors and their support staffs. This can usually be coordinated with the Preconstruction Meeting.
   2. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
      a. Last Name, First Name
      b. Company Name
      c. Email address (valid, work related)
      d. Work Phone Number (required, include area code)
      e. Cell Phone Number (not required, include area code)
   3. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
   4. The GC may provide project foreperson information for work being self-performed if he/she so desires.

B. It is preferred that the GC return the completed Project Directory spread sheet to the CPM as soon as possible to facilitate getting usernames and passwords assigned for all GC and SC personnel.
   1. All Contractors and support staff who have previously used SharePoint on another project will be able to use their existing username and password provided they have not had a name change, email address change, or have changed employers.

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

D. All GC/SC staff will be notified through email that usernames/ passwords are available. Generally, usernames are provided in a blanket email and passwords may be sent through individual follow up emails.
   1. Usernames/passwords may also be given out at the Pre-construction meeting if they have been created by that time.

3.2. AFTER THE CONTRACT IS SIGNED

A. After the contract has been fully routed, signed, and recorded by the CoM the GCPM may begin uploading construction related documents as they become available. This may include but not be limited to project schedules, submittals, RFI's, and other documents as needed.

F. All workflows, review of documentation, and general archiving of construction related documentation will be conducted on SharePoint.

3.2. MISCELLANEOUS CONTRACT DOCUMENTATION

A. SharePoint is only set up to be used by the CPM, CCM, and the PA Design Team for the sole purpose of managing the construction project. It is not intended to be used for the processing of other contract documentation. The following documents related to the execution of the contract will not be part of SharePoint:
   1. All documentation related to executing the contract, such as:
      a. Sub-Contractors list
      b. Affirmative Action documentation
      c. Bonding documentation
      d. Documentation associated with payroll verification
      e. Final documentation associated with closing out the contract
   2. Any documentation required/generated by ordinance, code or statute, such as;
      a. Erosion Control inspections
      b. Building Inspection Department inspections

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES

PART 1 – GENERAL

1.1. SCOPE

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

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

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

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

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

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

A. The GC shall prepare the initial LOS to include detail of daily tasks for the first six (6) weeks of construction for the Pre-construction meeting. The LOS shall be compatible and complimentary to the OPS.
B. The GC shall provide copies and lead a discussion on the LOS during the pre-construction meeting.
C. The LOS shall indicate start and end dates of each major task, associated related sub-tasks, and required parallel or pre-requisite tasks required to complete the major task on time.

D. The LOS shall also include identifying and scheduling such events as:
   1. Pre-installation meetings and mock-up review meetings.
   2. Quality management reviews of installations before they are covered.
   3. Owner provided equipment as designated by the contract documents.
   4. Work by others as designated by the contract documents.
   5. Critical submittal dates.
   6. Scheduled dates for testing, owner training, etc.
   7. Milestones designated by other specifications such as pre-closeout meetings, etc.

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

3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT)

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

END OF SECTION

SECTION 01 32 19
SUBMITTALS SCHEDULE

PART 1 – GENERAL

1.1. SUMMARY

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

B. The GC shall include the Administrative Submittals identified in item 1.6 below and shall be required to upload them to the Project Management Web Site (SharePoint).

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

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

1.2. RELATED SPECIFICATIONS

A. Section 01 29 76 Progress Payment Procedures

B. Section 01 31 23 Project Management Web Site (SharePoint)

C. Section 01 33 23 Submittals

1.3. RELATED DOCUMENTS

A. The following documents shall be used as the basis for initiating the original Submittals Schedule.

1. Drawing documents and specifications (including general provisions) as provided with the bid set documents and any published addenda.

B. The following documents shall be used to amend the submittals schedule as needed during the execution of this contract.

1. Documents associated with revisions or clarifications to number A.1 above after awarding of the contract, including but not limited to:

a. Construction Bulletins

b. Approved Change Orders

1.4. SUBMITTAL DEFINITIONS

A. Administrative Submittal: Any submittal that may be required by a Division 1 Specification and as noted in Section 1.6 below.

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

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

1. The word “SUBMIT” in specification text does not necessarily mean provide a submittal drawing.

a. For example: “Submit copies of all concrete testing reports…” does not mean to provide them as a submittal drawing. Instead these reports should be submitted to the Material Testing & Field Reports Library.

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 include all of the following Administrative Submittals on the Submittals Schedule.
   1. Wage Rates Form, see Specification 00 43 43
   2. Contractors Project Directory, see specification 01 31 23
      a. This should be submitted directly to the CPM before the SharePoint project site is functional.
   3. Schedule of Values, see Specification 01 29 73
   4. Submittals Schedule, this Specification, see section 3.1 below
   5. Photographic Documentation, see Specification 01 32 33
   6. Mockups, see Specification 01 43 39
   7. Testing Laboratory Services, see Specification 01 45 29
   8. Waste Management Plan, see Specification 01 74 19
   9. Closeout Requirement Checklist, see Specification 01 77 00
   10. Operation and Maintenance Data, see Specification 01 78 23
   11. Warranty Checklist, see Specification 01 78 36
   12. Spare Parts and Extra Materials, see Specification 01 78 43
   13. Demonstration and Training, see Specification 01 79 00

B. All Administrative Submittals shall be approved prior to requesting Progress Payment Number 1.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS

A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of submittals to the General Contractor.

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

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

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

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

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

A. The General Contractor shall be responsible for all of the following:
   1. Consolidating all submittal lists from individual contractors into one master list.

2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet with individual contractors to make changes as necessary.
3. The GC shall upload the final Submittal Schedule to SharePoint for review. See Specification 01 33 23 Submittals for more information on this procedure.
4. Resubmit the schedule as needed after initial reviews have been completed.

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

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

3.3. STAFF REVIEW RESPONSIBILITIES

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

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

END OF SECTION

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SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING

PART 1 – GENERAL

1.1. SUMMARY

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

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

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 31 19 Project Meetings

B. Section 01 31 23 Project Management Web Site (SharePoint)

C. Section 01 32 23 Photographic Documentation

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

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

B. The GC shall maintain daily progress journals on the Project Management Web Site (SharePoint) as outlined in Section 3.1 below.

1. Some projects may require weekly journals be kept instead of daily journals. This is at the sole discretion of the City Project Manager (CPM) or the City Construction Manager (CCM). A daily journal will generally be required when the contract has a significant amount of site work. A weekly journal will generally be used when a contract is interior work only.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONTRACTOR JOURNAL

A. The GC shall maintain a journal of daily progress on which Work is performed by any employee or entity for which the GC is responsible. Such reports shall include all relevant data concerning the progress of Work activities the GC and Subcontractors are responsible for and the effect of that activity on the time of performance of the Contract.

B. Journal entries shall be made on the Contractor Daily/Weekly Report Form located in the Construction Progress-Contractors Journal Library on the Project Management Web Site (SharePoint). The form consists of the following areas:

1. Weather; include temperature, humidity, precipitation, wind and other related information such as significant storm events, times, and details.
2. Delays encountered
3. Deliveries received or delayed
4. Hot issues that need to be addressed
5. Safety issues
2. Work completed by trade
7. Photograph progress and upload to the Photo Library on the Project Management Web Site (SharePoint).
8. Other including inspections, testing, etc.
9. Space for attaching documents

C. The Contractor may, with the approval of the CPM/CCM, use their own company form for progress reporting. The company form may be used as an attachment to the SharePoint form but items 1 through 5 in section B above must be filled out on the SharePoint form.

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

3.2. CONSTRUCTION PROGRESS MEETINGS

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

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1. SCOPE

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

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

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 31 23 Project Management Web Site (SharePoint)

B. Section 01 32 26 Construction Progress Reporting

1.3. SUBMITTALS

A. The GC shall provide general information on the type of camera being used for interior and exterior digital photographs.

1. Information may be written on contractors transmittal sheet.

B. Section 01 32 26 Construction Progress Reporting

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS

A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital device.

B. Digital photographs shall be properly zoomed in/out to capture a specific level of detail as necessary.

C. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is between 600 KB and 1.2 MB (1200KB).

D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify pictures in the title.

E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the PMWS.

3.2. PROJECT MANAGEMENT WEB SITE (SHAREPOINT)

A. The CPM/CCM shall provide weekly progress folders in the Project Images Library on SharePoint.

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

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

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

END OF SECTION

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SECTION 01 33 23
SUBMITTALS

PART 1 – GENERAL

1.1. SUMMARY

A. The General Contractor (GC) shall be responsible for providing submittals for review of all contractors and sub-contractors as designated in the construction documents. Submittals shall include but not be limited to all of the following:
   1. Equipment specified and pre-approved in the specification; to ensure quality, construction, and performance specifications have not changed since final design.
   2. Equipment specified by performance in the specification; to ensure that the intended quality, construction, and performance specified is met by the selected material or product.
   3. Shop, piece, erection, and other such drawings as indicated in the specifications to ensure all structural, dimensional, and assembly requirements are being met.
   4. Submittals indicating installation sequencing
   5. Submittals indicating control sequencing
   6. Contractor licensing, certification, and other such regulatory documentation when required by a specification.
   7. Other submittals as may be required by individual specifications.
   8. The word “SUBMIT” in specification text does not necessarily mean provide a submittal drawing.
      a. For example: “Submit copies of all concrete testing reports…” does not mean to provide them as a submittal drawing. Instead these reports should be submitted to the Material Testing & Field Reports Library.

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

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

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

1.2. RELATED REFERENCES

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

1.3. SUBMITTAL REQUIREMENTS

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

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

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

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

E. The word "SUBMIT" in specification text does not necessarily mean provide a submittal drawing.
   1. For example: "Submit copies of all concrete testing reports…" does not mean to provide them as a submittal drawing. Instead these reports should be submitted to the Material Testing & Field Reports Library.

PART 2 – PRODUCTS –NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTORS PROCEDURES

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

B. The GC shall upload the following Administrative Submittals to the Construction Administration – Submittal Drawings Library within 20 working days of receipt of the City of Madison Start Work Letter. Each Administrative

Submittal shall be loaded into the Library individually. All Administrative Submittals shall be approved prior to requesting Progress Payment Number 1.

1. Wage Rates Form, see Specification 00 43 43
2. Contractors Project Directory, see specification 01 31 23
   a. This should be submitted directly to the CPM before the SharePoint project site is functional.
3. Schedule of Values, see Specification 01 29 73
4. Photographic Documentation, see Specification 01 32 33
5. Submittals Schedule, this Specification, see section 3.1 below
6. Mockups, see Specification 01 43 39
7. Testing Laboratory Services, see Specification 01 45 29
8. Waste Management Plan, see Specification 01 74 19
9. Closeout Requirement Checklist, see Specification 01 77 00
10. Operation and Maintenance Data, see Specification 01 78 23
11. Warranty Checklist, see Specification 01 78 36
12. Spare Parts and Extra Materials, see Specification 01 78 43
13. Demonstration and Training, see Specification 01 79 00

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

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

E. A completed upload of the submittal to SharePoint initiates the review process workflow.

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

3.2. SUBMITTAL REVIEW

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

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

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

3.3. PROJECT ARCHITECTS REVIEW

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

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

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

END OF SECTION

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SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1. REQUIREMENT INCLUDED

Unless otherwise specifically directed by Contractor each Subcontractor and each Sub-subcontractor shall comply with provisions of this Section as required for proper execution and completion of their Work or portions thereof

1.2. PROCEDURES

Comply with and give notices required by applicable laws, statutes, ordinances, codes, rules, and regulations, and lawful orders of public authorities having jurisdiction applicable to performance of the Work. Comply with and give notices required by Owner's and Contractor's insurance companies, local utilities and labor regulations relating to the performance of the Work, the protection of adjacent property, and the maintenance of passage ways, guard fences and other protective facilities.

The Contractor shall acquire all permits, licenses, and approvals necessary for the execution of this Contract and performance of the Work and provide evidence of such applicable permits, licenses, and approvals at the Pre-Construction Meeting or before commencement of the Work.

Where Contract Documents require abatement of asbestos containing materials, prior written Notice to the State of Wisconsin, Department of Natural Resources is required. The Contractor shall provide evidence of such Notice prior to commencement of the Work.

Procure all certificates of inspection, use, and occupancy, and all permits and licenses, pay all charges and fees and give all notices necessary and incidental to the due and lawful prosecution of the Work. Certificates of inspection, use and occupancy shall be delivered to the Owner upon completion of the Work in sufficient time for occupation of the Project in accordance with the approved schedule for the Work. The costs of such procurement, payment and delivery shall be included within the Base Bid.

Exercise precaution at all times for the protection of persons (including employees) and property. Observe the safety provisions of applicable laws, building and construction codes. Refer to the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America.

It is not Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, and rules and regulations. However, if Contractor observes that portions of the Contract Documents are at variance therewith, Contractor shall promptly notify A/E and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

If Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities having jurisdiction, the Contractor shall assume full responsibility for such Work and shall bear the costs attributable to correction.

Refer to the Sections of the Work for referenced codes, standards, tests, etc., applicable to the Work.

1.3. NOTICES

Concealed or Unknown Conditions:

If the Contractor encounters conditions at the site are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual

nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any of the Work, will recommend and equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons.

If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites, or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume operations. The Contractor shall continue to suspend operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features.

1.4 PERMITS

Permits, Fees, Licenses, and Inspections: Unless otherwise provided in the Contract Documents, Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, inspections and approvals by government and utility agencies, necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

Owner will obtain plan approvals and pay all fees required by the Wisconsin Department of Safety and Professional Services.

Contractor shall obtain all permits and pay all fees required by local utilities for permanent electric and gas service.

Contractor shall obtain copies of all required permits and certificates of inspection applicable to the work.

Contractor shall furnish A/E and Owner with copy of all required permits and certificates.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 – EXECUTION - THIS SECTION NOT USED

END OF SECTION

SECTION 01 43 39
MOCKUPS

PART 1 – GENERAL

1.1. SUMMARY

A. Definition
   1. Mockups are field samples constructed, applied, or assembled at the project site for review by the Owner, Owners Representative, Architect and Consultants.
   2. Mockups are three dimensional, true scale models that illustrate materials and methods, equipment, workmanship, or location; based on plans, details, and assemblies.

B. Approved mockups establish the standard of quality by which the final work will be judged.

C. Approved mockups shall be properly documented and entered into the Submittal Library on the Project Management Web Site like any other required submittal. See section 3.4 below for more information.

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

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

1.4. PERFORMANCE REQUIREMENTS

A. All Contractors shall be responsible for providing and constructing mockups as specified in their Division of Work in the plans and specifications.

B. Materials to be used shall be as specified in the construction documents, full sized and properly assembled.

C. Completed mockups shall be of sufficient size to provide visible detail of all components as needed for the sample.

1.5. QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1. MATERIALS

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

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

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

PART 3 - EXECUTION

3.1. REVIEW THE PLANS AND SPECIFICATIONS

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

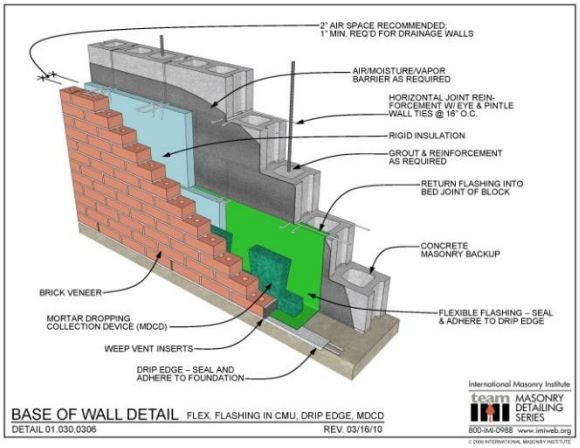
1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily accessible for review.
2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site protected from weather, construction traffic, and other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

3.2. MOCKUP CONSTRUCTION

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

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

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



D. The GC shall review the project manual and provide a consolidated MOCKUP LIST as a submittal for review (see Specification 01 32 19 Submittals Schedule, section 1.6). The mockup list shall indicate the specification number, name, and section number requiring the mockup, and a brief description of the required mockup.

1. Each type of cavity wall construction
2. Each type of construction containing hidden elements
3. Waterproofing systems
4. Air barrier systems
5. Flashing assembly

3.3. MOCKUP REVIEW

A. The General Contractor and all associated Sub-contractors (Contracting Team) shall meet with the Owner, Owners Representative, Architect and Consultants (Design Team) as necessary to review the mock-up. Contractors shall be prepared to answer questions on materials and methods as necessary.

B. The Contracting and Design Teams shall review the mockup in detail for materials, methods, and workmanship with respect to the intent of the contract documents. Improvements or adjustments shall be discussed as needed.

C. If the mockup is incomplete or does not show sufficient detail of products and workmanship the General Contractor shall resubmit a new mockup.

D. Re-submittal of mockups to meet the intent of the contract documents shall be the responsibility of the General Contractor. No Change Orders will be processed for additional time or materials associated with re-submitting a mockup for approval.

1. In the event that a submitted mockup meets the criteria of the contract documents but does not meet the expectations of the design team and alternative methods or materials are discussed the following procedure shall be used:
    a. Project Architect shall publish a Construction Bulletin (CB) to detail the required/recommended changes.
    b. The GC shall prepare and submit a new mockup.

3.4. FINAL SUBMITTAL

A. The field approved mockup shall be submitted by the General Contractor as any other submittal for project documentation purposes. The mockup submittal shall consist of the following:

1. Digitally photograph the field approved mockup. Take as many detailed photos as necessary to capture the complexity of the mockup.
2. Provide a written summary of the approved mockup. Include all recommended adjustments, level of expected workmanship, and other such detail as discussed during the mockup review.
3. Submit the mockup to the Project Management Web Site. See Specification 01 33 23 Submittals for additional information.

END OF SECTION

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SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

PART 1 – GENERAL

1.1. SUMMARY

A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are delivered for the contracted Work.
   1. The Progress Management Web Site (SharePoint) is a Construction Management tool that provides contractors and staff a single on-line location for the daily operations and progression of the Work.
   2. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it progresses. The City of Madison does not use a “Punch List” or “Corrections List” as it is typically known throughout the construction industry. The QMO process acts as an “in progress punch list”.
      a. By using the QMO process the City of Madison’s goal is to have a zero item punch list prior to the 90% progress payment and owner occupancy.

B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related specifications identified therein to become familiar with the terminology and expectations of this City of Madison Public Works contract.

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. PERFORMANCE REQUIREMENTS

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

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

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

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

1.4. QUALITY ASSURANCE

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

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

1.5. QUALITY MANAGEMENT OBSERVATION REPORT

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

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

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

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. QUALITY MANAGEMENT RESPONSIBILITIES

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

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

C. To initiate a QMO report:
1. Open a QMO report in the Quality Control – Quality Management Observation Library in SharePoint.
2. Enter the date and time of the field visit
2. Provide references to construction documents if any (examples; specification, drawing page, details, approved submittals, RFI, CB, etc.)
3. Provide a short title for the observation being made
4. Provide a detailed description of the observation being made
5. Click the Submit Observation button before closing the form.

D. Sharepoint will email a notification to the GC that a QMO report has been initiated. The software will also automatically notify the PA, CPM/CCM.

3.2. GC ACKNOWLEDGE QMO

A. Upon receiving the email indicating that a QMO report has been initiated the GC shall do all of the following:
   1. Review the form in the QMO Library.
   2. Provide any initial comments or instructions to sub-contractors in the box provided on the report.
   3. Review the list of contractors/sub-contractors in the list provided. Place a check mark in front of each contractor that he/she wants to review this QMO report.
   4. Click the GC Acknowledged button.

B. Sharepoint will email a notification to all of the contractors that have been checked on the list.

3.3. RESPONDING TO A QMO

A. All contractors receiving email notification of a QMO report 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 on SharePoint.
   2. In the QMO Tracking 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.

D. The initiator of the QMO report, GC, PA, CPM/CCM and others may have additional comments during the process of doing any corrective actions until the QMO report is closed.

3.4. GENERAL CONTRACTORS FOLLOW-UP

A. The GC shall inspect the work to ensure that all assigned contractors have remedied the observation to the intent of the construction documents.

B. The GC shall respond with any additional comments in his/her response box.
   1. If no comments are to be made the GC at a minimum must date the response box to trigger the next work flow.

C. Click the GC QMO Corrected button before closing the form.

D. The software will email a notification to the CPM/CCM and the person who initiated the QMO that the issue has been remedied.

3.5. QMO CLOSEOUT PROCEDURE

A. The CPM/CCM shall review all comments on the QMO report and verify with the initiator of the report that the issue has been remedied to the satisfaction of the contract intent.
   1. If satisfied the CPM/CCM shall close the QMO report.
   2. If the report is not satisfied the CPM/CCM shall work with the GC and the initiator what actions still need to be taken to satisfy the report.
      a. The CPM/CCM shall close the report once all concerns with the report are satisfied.

3.6. CONSTRUCTION CLOSEOUT

A. The GC shall note that successful close out QMOs are required for construction closeout as follows:

1. Certain progress payments as identified in Specification 01 29 76 are contingent QMO reports being properly closed out.

2. Specification 01 77 00 defines all construction closeout requirements.

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 31 19 Project Meetings
B. Section 01 31 23 Project Management Web Site (SharePoint)
C. Section 01 74 19 Construction Waste Management and Disposal

1.3. QUALITY ASSURANCE

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

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

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

1.4. TEMPORARY UTILITIES

A. General:

1. The existing electrical and water service may be used.
    a. Electrical Contractor shall extend temporary power from existing building services.
    b. Use trigger-operated nozzles for water hoses, to avoid waste of water.
2. New permanent facilities may be used provided that all facilities are in like new condition upon completion.

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

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

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

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

1.5. TELECOMMUNICATIONS SERVICES AND WI-FI

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

B. Telecommunications services shall include:

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

1.6. TEMPORARY SANITARY FACILITIES

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

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

1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials foreach facility. Provide covered waste containers for used material.

C. Maintain daily in clean and sanitary condition

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

1.7. BARRIERS

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

1.8. FENCING

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

1.9. EXTERIOR ENCLOSURES

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

B. Contractor shall provide temporary walls in the existing Lobby prior to beginning exterior wall demolition.
   1. Contractor shall work with the Owner to minimize impact on the use of the Lobby by staff and visitors.
   2. Temporary wall shall be a sturdy structure. Structure shall be insulated as much as practical for sound and building heat loss.
   3. Contractor shall work with the Owner to allow wall to be finished in a manner beyond rough carpentry.
C. Contractor shall be responsible for providing adequate structure and weatherproofing to protect all open roof areas during roof demolition and re-construction.
   1. Contractor shall be responsible for rain runoff, snow accumulation loads, and snow removal.

1.10. SECURITY

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

1.11. VEHICULAR ACCESS AND PARKING

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

1.12. WASTE REMOVAL

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

1.13. PROJECT IDENTIFICATION

A. Design, construct, install, maintain, and remove the authorized Temporary Project Sign as indicated in Section 01 50 00.
C. No other signs are allowed without Owner permission except those required by law.

1.14. FIELD OFFICES

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
B.
C. Provide space for Project Meetings with table and chairs to accommodate a minimum of ten (10) persons.
   1. The owner is providing space for Progress Meetings (see Section 01 31 19 3.3 for additional information and exceptions).
   2. Contractor shall be responsible for providing space for all other meetings.
D. Provide an adequately sized LCD monitor or other digital projection device to be connected to the computer identified in Section 1.5 Telecommunications Services (above), for use during progress meetings in connection with reviewing construction progress information posted to the Project Management Web Site (SharePoint) (Specification 01 31 23) hosted by the Owner.

PART 2 - PRODUCTS

2.1. TEMPORARY PARTITIONS

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

2.2. EQUIPMENT

A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting materials and employees.

B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures when exposed to moisture.

E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.

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

PART 3 - EXECUTION

3.1. TEMPORARY FIRE PROTECTION

A. Until fire protection needs are supplied by permanent facilities, General Contractor shall install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses.

B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

C. Locate fire extinguishers where convenient and effective for their intended purpose.

D. Store combustible materials in containers in fire-safe locations.

E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires.

F. Prohibit smoking on the premises.

G. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

H. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site

I. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.2. COLLECTION AND DISPOSAL OF WASTE

A. Collect waste from construction areas and elsewhere daily

B. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.

C. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg. F.

D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3. ENVIRONMENTAL PROTECTION

A. Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result.

B. Avoid use of tools and equipment which produce harmful noise.

C. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATIONS

A. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public Works Construction".
   1. Use the following link to access the Standard Specifications web page:
      http://www.cityofmadison.com/business/pw/specs.cfm
      a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison Standard Specification **2**10.2" click the link for Part II, the Part II PDF will open.
      b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.
      c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.

B. Section 01 57 21 Indoor Air Quality

C. Section 01 74 13 Progress Cleaning

D. Section 01 76 00 Protecting Installed Construction

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

1.3. QUALITY ASSURANCE

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

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

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR REQUIREMENTS

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

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

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

3.2. BULK MATERIAL

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

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

3.3. DRY PACKAGED MATERIAL

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

3.4. STRUCTURAL AND FRAMING MATERIAL

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

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

3.5. EQUIPMENT

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

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

3.6. FINISH PRODUCTS

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

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

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

3.7. DUCTWORK, PIPING, AND CONDUIT

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

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

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

3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT

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

1. The Owner or Owners Representative shall do the following:
   a. Inspect all deliveries upon receipt and notify manufacturer of any issues directly.
   b. Review the received shipment with the contractor.
      i. Only provide products or materials to the contractor that were not damaged through shipping or handling.
      ii. Confirm missing products or materials and anticipated delivery schedule if known.
2. The Contractor responsible for the installation of Work associated with Owner provided materials or products shall "take ownership" and provide safe and secure storage and handling as previously described within this specification.
      i. The Contractor shall be liable for the repair or replacement of any material or product damaged after taking ownership of the product from receipt through final acceptance.

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

1. The GC and/or Contractor responsible for the Work associated with the Owner provided materials or products shall do the following:
   a. Inspect all deliveries upon receipt and notify the Owner or Owners Representative of any issues directly.
      i. Owner or Owners Representative shall notify manufacturer of any issues directly.
   b. Review the received shipment with the Owner or Owners Representative
      i. Confirm missing products or materials and anticipated delivery schedule if known.
2. The Contractor shall "take ownership" and provide safe and secure storage and handling as previously described within this specification.
      i. The Contractor shall be liable for the repair or replacement of any material or product damaged after taking ownership of the product from receipt through final acceptance.

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

A. The Contractor shall provide and pay for field engineering services required for the Project:
   1. Land surveying services required to execute the Work, including but not limited to building addition location and layout, location and layout of pavements, and all proposed site improvements.
      a. The Contractors Surveyor shall be required to use owner provided datum and control points throughout the execution of this contract. See Section 01 32 23 Survey & Layout Data for more information.
   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. RELATED SPECIFICATIONS

A. Section 01 32 23 Survey & Layout Data
B. Section 01 78 29 Final Site Survey

1.4. 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.

1.5. 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.

1.6. RECORDS

A. Maintain a complete and 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

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 – GENERAL

1.1. SUMMARY

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

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. DEFINITIONS

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

1.4. QUALITY ASSURANCE

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

1.5. WARRANTY

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

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

PART 2 - MATERIALS

2.1. GENERAL

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

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

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

PART 3 - EXECUTION

3.1. EXAMINATION

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

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

3.2. PREPARATION

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

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

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

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

3.3. PERFORMANCE

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

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

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

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

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

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

3.4. CLEANUP AND RESTORATION

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

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

END OF SECTION

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SECTION 01 74 13
PROGRESS CLEANING

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

1.2. RELATED SPECIFICAITONS

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

1.3. QUALITY ASSURANCE

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

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

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

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

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

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

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

PART 3 - EXECUTION

3.1. SAFETY CLEANING

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

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

3.2. PROJECT SITE CLEANING

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

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

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

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

3.3. PROGRESS CLEANING

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

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

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

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

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

3.4. FINAL CLEANING

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

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

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

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

iii. Mop heads shall be rinsed often and replaced as necessary.
iv. Mop heads and buckets shall be thoroughly rinsed with each change of water.
v. Only new mop heads shall be used for rinsing.

E. Refer to all other specifications in this contract for specific requirements regarding final cleaning of finishes, fixtures, equipment, etc.

F. Exterior Cleaning shall include but not be limited to the following:
1. All exterior glazing surfaces have been professionally cleaned and are free of dust and streaking.
2. Metal roofs, siding, and other surfaces shall be clean of dirt and free of splashed or excess materials such as sealants, mortar, paint, etc.
3. All exterior furnishings shall be clean. Waste receptacles (if provided) shall be empty.
4. Paved areas shall be clean, free of dirt, oily stains and other such blemishes
5. Exterior lights and diffusers are clean and free of dust.

G. Interior Cleaning shall include but not be limited to the following:
1. Remove all labels, stickers, tags, and other such items which are not required by code as permanent labels.
2. All interior glazing surfaces, including mirrors, have been professionally cleaned and are free of dust and streaking.
3. All interior surfaces have been cleaned of excess materials such as paint, sealants, etc. and have been wiped free of dust.
4. Interior metals, fixtures, and trim have been cleaned free of dust and oily residues
5. Carpet flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
6. Resilient flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed, mopped and buffed per manufacturers use and care instructions.
7. Interior non-occupied concrete floors shall be broom cleaned, vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
8. Light fixtures, lamps, diffusers and other such items have been dusted and cleaned as necessary.

3.5. CALL BACK WORK

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

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.1. SUMMARY

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

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

1.2. RELATED SPECIFICAITONS

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

1.3. CITY ORDINANCES

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

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

1.4. DEFINITIONS

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

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

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

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

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

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

1.5. PERFORMANCE REQUIREMENTS

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

1.6. SUBMITTALS AND DELIVERABLES

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

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

1.7. QUALITY ASSURANCE

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

1.8. WASTE MANAGEMENT PLAN

A. Develop a plan consisting of waste identification, a waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume. Use the same units of measure throughout the waste management plan.
    1. Waste Identification: Indicate anticipated types and quantities of site clearing, demolition waste, and construction waste that will be generated during the execution of this contract. Include assumptions for the estimates.
    2. Waste Reduction Work Plan: The work plan shall consist of but not be limited to all of the following:
        a. Identify methods for reducing construction waste. Re-using, framing and forming materials, re-planning material cuts to minimize waste, etc.
        b. Identify what types of materials will be recycled. Provide lists of local companies that receive and/or process the materials. Include names, addresses, and phone numbers.
        c. Identify what types of materials will be disposed of and whether it will be disposed of in a landfill facility or by incineration facility. Provide lists of local companies that receive and/or process the materials. Include names, addresses, and phone numbers.
        d. Identify methods to be used on site for separating waste including all of the following:
            i. Sizes of containers to be used.
            ii. Labels to be used on the containers to identify the type of waste allowed in the container.
            iii. Designated locations on the project site for waste material containers.
B. If project requires demolition incorporate the ordinance required (MGO 28.185) Recycling and Reuse Plan into the Waste Management Plan.
C. Provide all of the following for the Waste Management Coordinator:
    1. Name, employer, employer address, phone number, and email address of the designated coordinator.
        a. The GC shall also provide this information with the required Project Directory Submittal at the beginning of the project.

D. If at the option of the GC, he/she chooses to contract with a Waste Management Disposal Company that allows comingled and unsorted waste materials, the GC shall include with his/her Waste Management Plan the following:
   1. Name, address, phone number, state permitting information, and other pertinent information about the disposal company.
   2. Documentation from the disposal company indicating company policies and procedures regarding comingled and unsorted waste materials to include:
      a. GC responsibilities on the project site.
      b. Disposal company procedures for receiving, sorting, recycling, and disposing of comingled and unsorted waste material.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. PLAN IMPLEMENTATION

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

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

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

D. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent and used facilities.
   1. Designate and label specific areas on the project site necessary for separating materials to be salvaged, recycled, reused, donated, and sold.
   2. Comply with any specification or regulatory requirements pertaining to dust, dirt, environmental protection, and noise control.

3.2. HAZARDOUS AND TOXIC WASTE

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

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

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

3.3. GENERAL GUIDELINES FOR ALL WASTES

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

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

C. Separate recyclable, reusable, and salvageable waste from other waste materials, trash, and debris except where Waste Management Disposal Company allows comingled waste materials, see section 1.8.D above.
   1. Separate by type in appropriate containers or designated areas according to the approved waste management plan away from the construction area. Do not store within the drip lines of existing trees.
   2. Inspect containers and bins frequently for contamination and inappropriately sorted materials. Remove contaminated materials and resort as necessary.
   3. Stockpile bulk materials such as sand, topsoil, stone, etc., on site away from the construction area and without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water, and cover to prevent windblown dust. Do not store within the drip lines of existing trees.
   4. Whenever possible store items off the ground and/or protect them from the weather.

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

A. The following guidelines is not a complete or all inclusive list and shall be adjusted as needed by the methods and procedures identified in the Waste Management Plan.

B. Asphalt Paving: Break-up into transportable pieces or grind, transport to an authorized recycling facility.

C. Carpet and Pad: Separate carpet and pad scraps, containerize and transport to an authorized recycling facility.

D. Ceiling System Components: Suspended ceiling system components shall be sorted by material type as follows:
   1. Broken, cut, or damaged tiles shall be containerized, transport to an authorized recycling facility.
   2. Damaged, or cut tracks, trim and other metal grid system components shall be sorted with other metals of similar types, palletize, transport to an authorized recycling facility.

E. Clean Fill: When allowed by Division 31 Specifications; concrete, masonry, stone, asphalt pavement, sand and other such materials may be used as clean fill on this project site. The GC shall verify with the Project Architect, Structural Engineer, or Civil Engineer as necessary prior to using any materials as clean fill. Materials shall be processed, placed, and compacted as specified. If not being re-used on site, transport to an authorized recycling facility.

F. Clean Wood Materials: Including but not limited framing cutoffs, wood sheathing or paneling materials, structural or engineered wood products, and pallets or crates. Clean Wood shall be free of paints, stains, oils, preservatives and other such contaminates.
   1. Useable pieces shall be sorted by type and dimension, bundled and transported off site by the GC or returned to the supplier.
   2. Non-useable pieces shall be palletized or containerized, transport to an authorized recycling facility.
   3. Clean, uncontaminated sawdust and wood shavings shall be bagged, transport to an authorized recycling facility.

G. Concrete: Break-up into transportable pieces, remove all reinforcing and other metals, transport to an authorized recycling facility.

H. Glass Products: Shall be sorted by types, do not include light fixture lamps and bulbs. Products broken in shipment shall be returned to the supplier. Broken or cracked items still in frames shall be taped to prevent further breakage and injury to workers. Transport to an authorized recycling facility.

I. Gypsum Board: Stack large clean pieces on wooden pallets or container, store in a dry location, transport to an authorized recycling facility.

J. Light Fixture Lamps and Bulbs: Fluorescent tubes shall be containerized, transport to an authorized recycling facility.

K. Masonry and CMU: Remove all metal reinforcing, anchors, and ties, clean undamaged pieces and neatly stack on pallets, transport damaged pieces to an authorized recycling facility.

L. Metals: Sort metals by type as follows, this does not include piping:
   1. Architectural metals including but not limited to siding, soffit, and roofing panels shall be sorted by material, palletize or bundle as needed and transport to an authorized recycling facility.
   2. Structural steel, sort by size and type; palletize and transport to an authorized recycling facility.
   3. Miscellaneous metals such as aluminum, brass, bronze, etc shall be sorted by type, containerized or palletized as necessary, transport to an authorized recycling facility.

M. Packaging and shipping materials
   1. Cardboard boxes and containers: Breakdown all cardboard boxes and containers into flat sheets. Bundle and store in a dry location until transported for recycling.
   2. Pallets:
      a. Whenever possible require deliveries using pallets to remove them from the project site.
      b. Neatly stack pallets in preparation for reusing them or providing them to other companies for salvage or re-use.
      c. Break down pallets into component wood pieces that comply with the requirements for recycling clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
   3. Crates: Break down crates into component wood pieces that comply with the requirements for recycling clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
   4. Polystyrene Packaging: Separate and bag materials.

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

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

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

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

3.5. GUIDELINES FOR DISPOSAL OF WASTES

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

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

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

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

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

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

END OF SECTION

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

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

1.2. QUALITY ASSURANCE

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

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

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

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

1.3. RELATED SPECIFICATIONS

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

1. Use the following link to access the Standard Specifications web page:
   http://www.cityofmadison.com/business/pw/specs.cfm
   a. Click on the "Part" chapter identified in the specification text. For example if the specification says "Refer to City of Madison Standard Specification **2**10.2" click the link for Part II, the Part II PDF will open.
   b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.
   c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.

B. Section 01 60 00 Product Requirements

C. Section 01 74 13 Progress Cleaning

PART 2 - PRODUCTS

2.1. INTERIOR FINISH PROTECTION MATERIALS

A. Except where noted in other areas of the construction documents or this specification the responsible contractor:

1. Shall not provide the cheapest or least effective method as an effort to meet any protection requirement.
2. Shall provide materials of sufficient quality, and durability to provide adequate protection based on the seasonal conditions and the anticipated duration at the time the protection will be needed.
3. Shall provide sufficient quantity of protection material to protect the construction as needed.

B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect (PA) and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as necessary.

1. The PA and CPM reserve the right to disapprove any proposed method and/or material and/or make alternate proposals.

PART 3 - EXECUTION

3.1. GENERAL EXECUTION REQUIREMENTS

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

B. The GC shall also be responsible for the following:

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

3.2. PROTECT ADJACENT PROPERTIES

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

B. It shall be the responsibility of the GC to do the following for all Work under this contract being performed on or adjacent to the property line:

1. Contact the adjacent property owner and provide him/her with information on the work to be done, equipment to be used, and estimated duration of the work. Information to be updated and communicated to property owner(s) as construction progresses and site conditions change.
   a. If any adjacent property is a rented or leased space the GC shall also make contact and provide the same information to the tenants.

b. Determine from the owner and/or tenants if there are any concerns for children, pets, special plantings, or other concerns.

2. Discuss the following with all contractors performing work on or near the property line.
   a. Work to be completed and timeline.
   b. Concerns of adjacent property owners/tenants from item 1 above.
   c. Which protective measures will be necessary to protect adjacent properties and address the concerns of adjacent property owners/tenants.
3. Ensure all protective measures are placed and maintained during the execution of Work on or adjacent to the property line. Interact with the adjacent property owners/tenants as needed.

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

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

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

3.3. PROTECT UTILITIES

A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and protection requirements prior to installing any construction protection.
1. This includes requesting utility marking through Diggers Hotline.
   a. Call 811 or 1-800-242-8511 to request a public utility locate
   b. For emergency locate call (262) 432-7910 or (877) 500-9592
2. Contact the Owner and CPM for any available private utility information on the property that may be available prior to calling a private utility locating company.

B. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.
1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to not be directly over the utility main.
2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison Standard Specification 210.1(g) and Type C Construction Barrels when necessary.
3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to City of Madison Standard Specification 210.1(g) and Type E fencing for areas on soil.

3.5. PROTECT STORED MATERIALS

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

3.7. PROTECT WORK - EXTERIOR

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

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

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

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

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

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

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

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

3.8. PROTECT WORK - INTERIOR

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

B. The contractors responsible for interior work shall be responsible for protecting their work and finishes from dirt, mud, snow, spills, splatters, and physical damage after installation as follows:
   1. Protect vinyl composite, rubber composite, painted/stained concrete, and tiled flooring as follows:
      a. Define foot traffic areas and protect with Ramboard Temporary Floor Protection products as a minimum basis of design or other protection product(s) compatible with installed flooring product if Ramboard is not compatible. Products to be used shall be new.
         i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
         ii. Repair tears immediately, replace worn areas with like material as necessary.
   2. Protect carpeted areas as follows:
      a. Define foot traffic areas and protect with a minimum of 6mil, clear, polyethylene sheeting 3 feet wide. Products to be used shall be new.
         i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
         ii. Repair tears immediately, replace worn areas with like materials as necessary.
   3. Protect all finished walls in high traffic areas with Ramboard Temporary Wall protection products or approved equal.
         i. Tape all edges, seams, etc. with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
         ii. Repair tears immediately, replace worn areas with like materials as necessary.
   3. Protect counter tops, cabinets, and other finished surfaces with large sheets of thick cardboard or Ramboard products. Do not allow toolboxes, finish materials, parts and other such items to be placed on finished materials.

C. All protection shall stay in place until the CPM, PA, and GC mutually deem the project is ready for Final Cleaning. The contractors responsible for protecting the work shall be responsible for removing the protection and removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning materials for removing adhesives, etc.

D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other protection as noted within this specification for the duration of their work.
   1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to complete the work being done.
   2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc. when doing touch-up work.
   3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any costs associated with cleaning, repairing or replacing already finished construction at no additional cost to the contract.

END OF SECTION

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

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

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

1.2. RELATED SPECIFICATIONS

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

B. Section 01 29 76 Progress Payment Procedures
C. Section 01 31 23 Project Management Web Site (SharePoint)
D. Section 01 32 26 Construction Progress Reporting
E. Section 01 32 33 Photographic Documentation
F. Section 01 45 16 Field Quality Control Procedures
G. Section 01 74 13 Progress Cleaning
H. Section 01 45 16 Construction Waste Management and Disposal
I. Section 01 76 00 Protecting Installed Construction
J. Section 01 78 13 Completion and Correction List
K. Section 01 78 23 Operation and Maintenance Data
L. Section 01 78 36 Warranties
M. Section 01 78 39 As-Built Drawings
N. Section 01 78 43 Spare Parts and Extra Materials
O. Section 01 79 00 Demonstration and Training
P. Other requirements as noted in the contract documents signed by the General Contractor

1.3. DEFINITIONS

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

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

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

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

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

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

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

1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT

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

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

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

1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT

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

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

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

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

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

1. Weekly Payroll Reports
2. Employee Utilization Reports
3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
5. Documentation required for Small Business Enterprise (SBE) goals
6. Other documents as maybe required or requested through the Finalization Review Process

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONSTRUCTION CLOSEOUT CHECKLIST

A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Construction Closeout Requirements to the GC.
   1. The checklist shall include all items identified within the construction documents that require any of the following (and examples) prior to moving into Contract Closeout Procedures:
      a. Documents indicating a specified level of performance has been achieved, such as:
         i. Test reports of all types
         ii. Startup reports
      b. Required documentation, such as:
         i. As-builts and record drawings
         ii. Operation and maintenance data
      c. Physical items to be turned over to the owner, such as:
         i. Attic stock
         ii. Keys
      d. Required maintenance completed, such as:
         i. Ducts cleaned
         ii. Filters replaced
      e. Commissioning and LEED related items and submittals
      f. Owner and Maintenance Training

B. Each list shall indicate the title of the closeout requirement, the associated specification of the requirement, the required result or deliverable, the responsible contractor(s), and a column to verify the item has been turned in and completed.

C. The GC shall be responsible for all of the following:
   1. Consolidating all the closeout lists into one master Construction Closeout Checklist.
      a. The checklist shall be in a tabular data format similar to the sample below
   2. Upload the completed checklist to the Contract Closeout-Miscellaneous Documents Library on the Project Management Web Site for review.
   3. Resubmit the checklist as needed after initial reviews have been completed.

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

Title	Specification	Description	Responsibility	Completed
Quality Management Observation Reports	01 45 16	All QMO reports have been properly responded to, reviewed and closed by the CPM/CCM.	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/CCM, shall review all requirements for Construction/Contract Closeout during two (2) special meetings.

a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall discuss the requirements associated with various construction/contract closeout documentation and events when they are due with respect to progress payments.
b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting shall review the contractors progress regarding the closeout checklist, begin making plans for upcoming deadlines such as scheduling training, where to put attic stock, and when they are due with respect to progress payments.

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

3.3. CONSTRUCTION CLOSEOUT PROCEDURE

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

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

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

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

3.4. CONTRACT CLOSEOUT REQUIREMENTS

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

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

3.5. CONTRACT CLOSEOUT PROCEDURE

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

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

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

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

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

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

END OF SECTION

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SECTION 01 78 13
COMPLETION AND CORRECTION LIST

PART 1 – GENERAL

1.1. SUMMARY

A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are delivered for the contracted Work.

1. The Progress Management Web Site (SharePoint) 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 (SharePoint)
C.	Section 01 45 16	Field Quality Control Procedures
D.	Section 01 77 00	Closeout Procedures

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1. SUMMARY

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

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

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

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

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

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

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

1.4. O&M/U&C DATA REQUIREMENTS

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

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

b. Supplier of product
c. Product manufacturer internet site

2. Acceptable PDF files shall have the following functionality:
a. Word searchable
b. Key areas are bookmarked
c. Table of Contents and/or Index linked to content is preferred whenever possible.

3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be rejected without further review.

B. O&M/U&C Data shall include but not be limited to the following manufacturers' published information as appropriate for the equipment, system, material, or finish:
1. Installation instructions
2. Parts lists, assembly diagrams, explosion diagrams
3. Wiring diagrams
4. Start-up, shut-down, troubleshooting and other related operation procedures
5. Lubrication, testing, parts replacement, and other such maintenance procedures
6. General use, care, and cleaning instructions
7. Special precautions and safety requirements
8. A list of certified equipment vendors, service companies, parts suppliers including company name, address, and phone number
9. A list of the recommended spare parts to have on hand at all times
10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
11. Copies of final test reports, balance reports, and other related documentation
12. Warranty information for equipment and systems

1.5. O&M/U&C DATA SUBMITTALS

A. O&M/U&C Data shall be prepared as identified in this specification and shall be submitted for review as per the schedule identified in Specification Section 01 29 76, Progress Payment Procedures.

B. O&M/U&C Data Draft submittals will be reviewed for content, procedure, and compliance only. A general critique with recommendations for improvement will be made but re-submittals will not be required.

C. O&M/U&C Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be required until such time as each submittal is accepted.

NOTE: Acceptance of O&M/U&C Data Final submittals is required to be complete prior to scheduling and conducting owner related training and construction closeout.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. O&M/U&C DATA CHECKLIST

A. At the beginning of the contract 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 O&M/U&C requirements to the GC.

B. The GC shall be responsible for all of the following:
1. Consolidating all of the O&M/U&C lists into one master O&M/U&C Checklist.
a. The checklist shall be in a tabular data format similar to the sample below in Section 3.2.
2. Upload the completed checklist to the Submittal Library on the Project Management Web Site (SharePoint) 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.

3.1. O&M/U&C DATA PREPARATION - GENERAL

A. All contractors shall prepare O&M/U&C Data for draft and final submission as follows:
1. Obtain digital PDF files for each piece of equipment, system, material or finish as described in Sections 1.4.A.1 and 1.4.A.2 above.
2. Verify that all information as described in Section 1.4.B above is included with the PDF file. Obtain missing information as necessary for a complete submittal.

B. Rename each individual PDF file as follows.

1. Do not use special characters such as #, %, &, /, etc. These characters are reserved by the Project Management Web Site (SharePoint) software the City of Madison uses; however the under-score (or under-bar) '_' is an allowed character.
2. Use the following format and examples for renaming your file:
   a. Format: ***Equipment name_What_CONTRACT T.B.D._Year***
      i. *Equipment Name* represents the name of any equipment, system, material or finish as designated in the Contract Documents.
      ii. *What* represents what the file is about use only the following:
         - Use **O&M** for Operation and Maintenance manuals
         - Use **U&C** for Use and Care instruction manuals
      iii. *CONTRACT T.B.D.* is the specific identification number the Work was bid under and appears on the plan set title sheet and in each sheet title block
      iv. *Year* represents the year the contract will be closed out
   b. Examples of file names to be used for this contract are:
      i. AHU 2_O&M_8162_2019
      ii. CPT 2_U&C_8162_2019

C. All contractors shall submit the completed digital PDF files to the GC in sufficient time for the GC to meet the O&M/U&C Data submission deadlines as described in Specification Section 01 29 76, Progress Payment Procedures.

D. O&M/U&C Data shall be submitted and reviewed as described in sections 3.2 and 3.3 below.

3.2. O&M/U&C DATA DRAFT SUBMITTAL

A. All contractors shall prepare and submit the following for an O&M/U&C Data Draft review submittal:
1. Provide a complete list of required O&M/U&C submittals to be furnished for review prior to contract closeout, submit the list to the GC for consolidation.
   a. Review the administrative submittal drawing established by the GC at the beginning of the contract.
   b. Review specifications, drawings, Construction Bulletins, RFIs and other information that may have changed the Work during the contract.
   c. Append the original submitted master list as needed.
   d. Where multiple units of the exact same model and function have been installed only one O&M/U&C shall be required. The title shall incorporate equipment identifiers or finish designations for clarity.
   e. GC shall provide a consolidated checklist similar to this example for all O&M/U&C submittals to be provided prior to closeout.

Title	O&M or U&C	Specification	Completed (date)
Overhead Door Operator	O&M	08 36 00	
Air Handling Unit (AHU-1 & 2)	O&M	23 00 00	
Air Handling Unit (AHU-3)	O&M	23 00 00	
Carpet (CPT-2)	U&C	09 68 00	

2. Each contractor providing equipment or finished materials shall provide a minimum of one (1) and a maximum of three (3) draft submittals based on their total final O&M/U&C submittal requirements. The GC shall be responsible for determining the total draft requirements for each contractor.

B. The GC shall be required to review all contractors' samples and checklists for compliance with this specification and shall return any to the originating contractor that are insufficient for re-submittal.
1. When acceptable to the GC, he/she shall upload each O&M/U&C Data draft submittal file to the O&M Draft library on the Project Management Web Site (SharePoint).

C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the O&M/U&C Data draft submittals and checklist within fifteen 15 working days as follows:
1. Provide general critique comments by Division on O&M/U&C Data samples submitted. Critique is intended to provide all contractors with information on strengths and weaknesses of their submittals.
   a. Re-submittal of the O&M/U&C Data samples will not be required.
2. Review in detail the O&M/U&C Data Checklist for completeness. Provide comments as needed.
   a. Re-submittal of the O&M/U&C Checklist will be required until accepted.

3.3. O&M/U&C DATA FINAL SUBMITTAL

A. All contractors shall prepare and submit the following for an O&M/U&C Data Final review submittal:
   1. Prepare complete O&M/U&C Data files as described in Section 3.1 above according to their approved checklist as described in Section 3.2 above.
   2. Submit completed checklist and all final O&M Data files to the GC for final submittal review.

B. The GC shall be required to spot check all contractors' submittals for completeness against their checklists and for compliance with this specification and shall return any to the originating contractor that are insufficient for re-submittal.
   1. When acceptable to the GC, he/she shall upload each O&M/U&C Data final submittal file to the O&M Final library on the Project Management Web Site (SharePoint).

C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the O&M/U&C Data final submittals and checklist within fifteen (15) working days as follows:
   1. Review the files submitted against the checklist and request any missing files through the GC.
   2. Review in detail all of the O&M/U&C Data files for completeness.
      a. Submittals shall be accepted or rejected as individual PDF files.
      b. Contractors shall re-submit entire O&M/U&C submittal if any portion is rejected or incomplete.

3.4. CONSTRUCTION CLOSEOUT

A. All contractors shall review Specification 01 77 00, Closeout Procedures and Specification 01 79 00 Demonstration and Training.
   1. Acceptance of all final O&M/U&C Data submittals is required prior to scheduling Demonstration and Training Sessions.
   2. Completion of all Demonstration and Training Sessions is required to receive the Substantial Compliance for Occupancy Certificate, and to begin Construction Closeout procedures.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items required by the Construction Documents.

B. Manufacturers' disclaimers and limitations on product warranties do not relieve any contractor of the warranty on the Work that includes the product.

C. Manufacturers' disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and any contractor required to provide special warranties under the contract documents.

1.2. RELATED SPECIFICATIONS

A. Section 01 29 76 Progress Payment Procedures
B. Section 01 31 23 Project Management Web Site (SharePoint)
C. Section 01 77 00 Closeout Procedures
D. Section 01 78 23 Operation and Maintenance Data
E. Other Divisions and Specifications that may address more specifically the requirements for Warranties related to the installation of all items and equipment installed under the execution of the Work.

1.3. DEFINITIONS

A. See specification 01 77 00 for the definitions of the following terms that may also be used in this specification:
1. Substantial Compliance
2. Certificate of Occupancy
3. Certificate of Substantial Completion
4. Construction Closeout
5. Contract Closeout

B. Emergency Repair: The Owner or Owner Representative reserves the right to make emergency repairs as required to keep equipment or materials in operation or to prevent damage to property and injury to persons without voiding the contractors warranty or bond or relieving the contractor of his/her responsibilities during the warranty period.

C. Installer: The company or contractor hired to install a finished product that was manufactured and supplied specifically for the Work within this contract. The Installer may or may not be the same company that supplied the product. See the definition for supplier.

D. Supplier: Any company that makes a specific finished product for the Work from information within the Contract Documents. Examples of suppliers would include custom cabinets, steel stairs and railings, etc. A supplier would not be a company that distributes items manufactured by others such as an electrical or plumbing supplier.

E. Warranty: A written guarantee from the manufacturer to the owner on the integrity of a product and its installation, and the manufacturers' responsibility to repair or replace the defective product or components within a specified time from the date of ownership. Warranty may also be used interchangeably with Guarantee. The following warranty types may be part of any specification within the Work associated with the Construction Documents:

1. Expressed Warranty: A warranty that provides specific repair or replacement for covered components of a product over a specified length of time.
2. Implied Warranty: A warranty that is not stated explicitly by a seller or manufacturer that the product is merchantable and fit for the intended purpose.
3. Standard Product Warranty: Preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner. Standard warranties may be for any amount of time but shall not be for anything less than one (1) year from the warranty date.
4. Special Warranty: A written warranty required by the Contract Documents either to extend the time limit provided under a standard warranty or to provide greater rights to the Owner.

F. Warranty Date: The effective date that begins all warranty periods required for products, installations, and work-manship associated with the execution of the Work for this contract. The Warranty Date shall be set by the CPM.

G. Related Damages and Losses: When correcting failed or damaged Warranted Work, remove and reinstall (or replace if necessary) the construction that has been damaged as a result of the failure or the construction that must be removed and replaced to obtain access for the correction of Warranted Work.

H. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected reinstate the warranty by a new written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation unless specifically noted otherwise in a specification.

I. Replacement Cost: All costs that may be associated with Work being replaced under warranty including but not limited to the following:
1. Related damages and losses
2. Labor, material and equipment
3. Permits and inspection fees
4. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.

J. Replacement Work: All materials, products, required labor, and equipment necessary to replace failed or damaged warranted to an acceptable condition that complies with the requirements of the original Construction Documents.

K. Owners Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, and remedies.
1. Rejection of Warranties: The Owner reserves the right to reject any warranty and to limit the selection of products with warranties not in conflict with the requirements of the contract documents.
2. Where the Contract Documents require a Special Warranty or similar commitment on the Work or product, the Owner reserves the right to refuse acceptance of the Work until the Contractor presents evidence the entities required to countersign such required commitments have done so.

1.4. GENERAL CONTRACTORS RESPONSIBILITIES

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

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

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

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

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

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

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

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

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

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

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

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 Public Health Office Remodel, CONTRACT 8182, and contract address the warranty is for, on the reference line.
3. Provide a description of the warranty(ies) being provided.
    a. Include Division, Trade, or Specification information as necessary.
    b. Only combine warranties of related Divisional Work together. Create new letters for additional Divisions as necessary.
4. Indicate the effective Warranty Date. As noted in Section 1.3.F above, the Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
5. Contractor Letters of Warranty shall only be signed by a principal officer of the company.
6. After signing the letter provide the GC with a high quality color scanned image in PDF format and the original signed letter.

B. The GC shall be responsible for the Final Warranty submittal as identified in Section 3.4 below.

C. The GC shall obtain letters of warranty from all of the following:

1. The General Contractor shall provide warranty letters for all Work that was self performed under the contract documents, identify all trades or Divisions of Work.
2. All Sub-contractors shall provide warranty letters for Work performed under the contract documents; identify all trades or Divisions of Work.
3. Suppliers, as required by other specifications within the Construction Documents where the manufacture of a specific product unique to the Work of this contract was required.
    a. The terms and conditions of the Supplier Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship within one (1) year of the warranty date.
    b. When the supplier is also the installer a single written letter may be submitted identifying both the warranty for the manufacture of the product and the warranty for the installation of the product.
4. Installers as required by other specifications within the Construction Documents where the installation of a specific product unique to the Work of this contract was required.
    1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair,

or replace defective materials and workmanship associated with the installation of the product within one (1) year of the warranty date.

5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who agrees to provide warranty services required by any Division Specification in excess of their Standard Product Warranty.

3.3. STANDARD PRODUCT WARRANTY

A. All contractors shall be responsible for collecting and providing copies of all standard product warranties for commercially available products purchased and installed under this contract.

B. Only one copy of the manufacturers' standard warranty needs to be submitted as representative for all quantities of the same model number used throughout the Work.

C. Provide the manufacturers certificate, letter, or other standard documentation for each Standard Product Warranty submitted as follows:

1. Whenever possible a PDF version of the document shall be used.
    a. If a PDF version is used all additional information shall be completed using simple PDF editing tools such as text boxes, highlight, etc.
    b. If a PDF version is not available and an original document is furnished the additional information shall be neatly hand written and highlighted on the document in such a fashion so that it does not obscure any part of the written warranty.
2. Provide the following additional information on each warranty document:
    a. Contract warranty date.
    b. Provide the manufacturer name and model number of the product if not specified within the warranty.
        i. Where the manufacturer name and model number is specified within the warranty it shall be highlighted for visibility.
    c. Provide the plan identifier (LAV-1, WC-2, etc) when applicable.

D. Each completed warranty shall be saved as a digital PDF. The file shall be named using the specification number and item description. I.E. 22 42 00 Toilet (WC-1).pdf
    a. Where an original certificate was furnished provide a high quality colored scan of the completed document with the additional information. Save the scanned image in PDF format and use the same naming convention as indicated above.

E. Provide all PDF files and any original documents to the GC for final consolidation to be provided to the Owner.

3.4. FINAL WARRANTY SUBMITTAL

A. The GC shall receive all required warranties (digital PDF and any original documents) from all contractors, suppliers, installers and manufacturers.

B. The GC shall inventory all received warranties with the Warranty Submittal List to ensure all required warranties have been received and all warranty periods are correct according to the specifications.

C. Provide with each Operation and Maintenance Manual a complete copy of any associated warranty.

D. Scan all warranties into a single organized electronic PDF file as follows:
1. Organize the PDF file into an orderly sequence based on the table of contents of the Specifications.
2. Provide a typed Table of Contents for the entire file at the front of the document.
3. Provide bookmarks and links to each individual PDF to enable quick navigation through the PDF document.

E. Upload the warranty submittal to the appropriate document library on the Project Management Web Site (SharePoint) for review by the PA and CPM.

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

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

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

b. The Contract Closeout-Warranty Issue Library on the Project Management Web Site (SharePoint) uses a form for each warranty issue that is logged into the system.
   i. The GC shall open each warranty issue form, review the issue description and any attached documentation or photos.
   ii. The GC shall also notify any other sub-contractor, supplier, or installer that may be required to review the warranty issue.

B. Warranty Response:
1. The GC shall upon notification by the City of Madison provide warranty response as follows:
   a. Critical Systems or equipment: Where damage to equipment and other building components, or injury to personnel is probable provide immediate emergency shut-down information and an on-site response team as soon as possible but in no case shall on-site response exceed 24 hours.
   b. For non-critical responses where damage or injury is unlikely provide on-site response no later than the next business day.
   c. Where Technical Assistance support is part of the written warranty provide all assistance necessary via phone, text, or internet systems as indicated by the warranty. If issues cannot be resolved provide on-site response no later than the next business day.
   d. If the request cannot be supported in sufficient time as outlined above the Owner (or Owner Representative) reserves the right to contact other contractors or service companies having similar capability to expedite the repair or replacement and shall invoice all associated costs to the Owner back to the GC.

C. Warranty Execution:
1. The GC shall provide all repairs or replacements as necessary to restore broken or damaged Work to the original level of acceptance as intended by the Contract Documents.
   a. Provide all materials, equipment, products, and labor necessary to complete the repair or replacement associated with the Warranty Issue.
   b. Provide all cleaning services as may be required before, during, and after the repair or replacement as per Specification 01 74 13 Progress Cleaning.
   c. Provide any protection necessary for existing construction as per Specification 01 76 00 Protecting Installed Construction
   d. Provide new letters of warranty when required.

D. Warranty Follow-up:
1. Logged Warranty Issues:
   a. The GC shall provide complete documented responses of all logged Warranty Issues. Responses shall provide a description of work completed, by who, inclusive dates, and photos of completed or repaired work.
      i. Provide call back response if work is not acceptable.
   b. The City Project Manager shall review the submitted response documentation and do a field inspection if necessary.
      i. If work is not acceptable, contact GC to review details and expectations of the repair as needed.
      ii. If work is acceptable close the Warranty Issue.
2. Quarterly Warranty Reviews:
   a. The GC shall be responsible for scheduling quarterly on-site review with all of the following:
      i. City Project Manager, and other City staff as needed
      ii. Owner and Owner Tenant Representative
      iii. Commissioning Agent (CxA)
      iv. Plumbing, Heating, Electrical Sub-contractors
      v. Other Sub-contractors that may be responsible for open Warranty issues
   b. Quarterly reviews shall be scheduled at 3 months, 6 months, and 11 months after the effective date of the warranty. The review meetings shall:
      i. Review the status of all open Warranty Issues, determine course of action and estimated date of completion.
      ii. In the appropriate quarter, provide shut-down, start-up, testing, and training of off-season equipment as required by the contract documents.
      iii. The 11th month review shall review all open Warranty Issues, final plan for resolution, and all Warranty Issues where a new letter of warranty may have been issued.

END OF SECTION

SECTION 01 78 39
AS-BUILT DRAWINGS

PART 1 – GENERAL

1.1. SUMMARY

A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they pertain to City of Madison contract procedures regarding the accurate recording of the Work associated with the execution of this contract. This shall include but not be limited to work that will be hidden, concealed, or buried.

B. Each contractor shall be responsible for maintaining an accurate record of all installations, locations, and changes to the contract documents during the execution of this contract as it may relate to their specific division or trade.

C. The General Contractor (GC) shall be responsible for ensuring all contractors provide as-built record information to the Master As-Built Document Set as described in this specification.

1.2. RELATED SPECIFICAITONS

A. 01 26 13 Request for Information
B. 01 31 23 Construction Bulletin
C. 01 32 33 Photographic Documentation
D. 01 26 63 Change Orders
E. 01 29 76 Progress Payment Procedures
F. 01 31 23 Project Management Web Site (SharePoint)
G. 01 33 23 Submittals
H. 01 77 00 Closeout Procedures
I. Other Divisions and Specifications that may address more specifically the requirements for field recording the installation of all items associated with the execution of this contract by Division or Trade.

1.3. RELATED DOCUMENTS

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

1.4. PERFORMANCE REQUIREMENTS

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

B. The GC shall designate one person of the GC staff to be responsible for maintaining the Master As-Built Document Set at the job trailer. This shall include, posting updates, revisions, deletions and the monitoring of all contractors posting as-built information as described in this specification.

C. All contractors shall use this specification as a general guideline regarding the requirements for documenting their completed Work. Contractors shall explicitly follow additional specification requirements within their own Division of Trade as it may apply to this specification.

1.5. QUALITY ASSURANCE

A. The GC shall be responsible for all of the following:
   a. Spot checking all sub-contractors field documents to insure daily information is being recorded as work progresses.
   b. Discuss as-built recording to the plan set at weekly job meetings with all sub-contractors on site.
   c. Schedule time with sub-contractors in the job trailer for recording as-built information to the plan set.
   d. Insure that all sub-contractors are providing clear and accurate information to the plan set in a neat and organized manner.
   e. Insure sub-contractors who have completed work have finalized recording all as-built information to the plan set before releasing them from the project site.

B. The Project Architect, the City Project Manager, Commissioning Agent and other design team staff will perform random checks of the Master As-Built Document Set during the execution of this contract to ensure as-built information is being recorded in a timely fashion as the Work progresses. An updated and current Master As-Built Document Set is a stipulation for approval of the progress payment.

PART 2 – PRODUCTS

2.1. OFFICE SUPPLIES

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

PART 3 - EXECUTION

3.1. FIELD DOCUMENT AS-BUILTS

A. The GC and all Sub-contractors shall be responsible for keeping their own field set of as-built documents including plans, specifications and published changes.

B. Field sets shall be kept dry and in good condition at all times.

C. No Work shall be buried, covered, or hidden, by any additional Work, regardless of Contractor or Trade, until locations of all materials and equipment has been properly documented as described in section 3.2 below.

D. All contractors shall be required to record the following as-built information:
   a. Notes on the daily installation of materials and equipment.
   b. Sketches, corrections, and markups indicating final location, positioning, and arrangement of materials and equipment such as pipes, conduits, valves, cleanouts, pull boxes and other such items. Note all final locations on plan sheets, indicate dimension off identifiable building features. Riser diagrams need only be corrected for significant changes in locations, routing or configuration.
      i. The use of photographs in lieu of hand drawn sketches is acceptable.
      ii. Photos shall be taken according to Specification 01 32 33 Photographic Documentation
      iii. Print photo and markup with dimensions or notes as necessary.
   c. Identify by the use of existing plan symbology and notes the size, type, quantity, and use as applicable of materials such as pipes, valves, conduits, etc.
   d. Note whether horizontal runs are below slab or above ceiling, include dimensions above or below finished floor elevation.

E. All contractors shall be responsible for transferring the information from their field set of documents to the Master As-Built Plan Set kept in the GC job trailer. See Section 3.3.D. below for the proper procedure.

F. All contractors shall update the GC Master Plan Set as often as necessary, but not less than once per work week.

3.2. SITE SURVEY AS-BUILT

A. The Land Surveyor Sub-Contractor (PLS) shall provide digital as-built information in the horizontal and vertical datum provided in Specification 01 32 23 Survey and Layout Data.

B. The PLS shall include but not be limited to including all of the following as part of the site survey as-built:

1. For underground buried utility laterals and services of all types locate all of the following that may apply:
    a. Connection points at all mains.
    b. Storm discharge points to open air.
    c. All corners and bends regardless of angle, large radius sweeps shall have multiple point locations sufficient to define the sweep.
    d. All vertical drops.
    e. All wells.
    f. Private buried utilities such as buried electrical cables, irrigation systems, etc.
    g. Other information that may need to be located in the future by the owner prior to digging.
2. Record all surface features including but not limited to the following:
    a. Building corners, pavement edges, and other permanent structural features.
    b. All surface covers for inlets, catch basins, cleanouts, access structures, curb stops and other such devices.
    c. Other permanent surface features such as hydrants, lamp posts, and other permanent site amenities.
3. The following data shall be recorded while locating items in sub-sections 3.2.a and 3.2.b above:
    a. Flow lines at both ends of pipes
    b. Pipe sizes and material types
    c. Rim elevations for all covers
    d. Sump elevations and invert elevations of all structures
    e. Spot elevations for all pads, driveways, walks, stoops, and floors
4. Sufficient spot elevations shall be taken to provide a terrain model that will accurately generate contours.
    a. Contours for this contract shall be generated at 1’-0” intervals.
    b. Primary contour intervals shall be every 10’-0”
    c. Except in areas of congestion all contours shall be labeled with text in the required datum

C. The PLS shall provide the final digital as-built on a thumb drive or CD in Auto CAD 2017, MicroStation V8i, or DXF format to the GC for turn in to the Project Architect and the Civil Engineer.

3.3. MASTER AS-BUILT DOCUMENT SET

A. The GC shall be responsible for maintaining the Master As-Built Document Set in the job trailer at all times.

1. The Master As-Built Plan Set (Plan Set) shall begin with one complete bid set of drawings and any additional sheets that were supplied by published addenda during the bidding process. The cover sheet shall be titled as the “Master As-Built Plan Set” in large bold red letters approximately 2” in height and shall not be used for any other purpose.
    a. The Plan Set shall be kept dry, legible, and in good condition at all times.
    b. The Plan Set shall be kept up to date with new revisions within two (2) working days of supplemental drawings being issued. Revisions shall be posted as follows:
        i. Insert new, revised sheets into the plan set. Void old sheets but do not remove them from the plan set. Indicate date received and what document (RFI, CB, CO, etc.) caused the change.
        ii. Insert new, revised individual details into the plan set. Void old details, tape new details over the old details with a “tape hinge” to allow them to be viewed. Indicate date received and what document (RFI, CB, CO, etc.) caused the change.
        iii. Add new details in appropriate white space on relevant sheets. If no space is available use the back side of the previous sheet or insert a new sheet. Indicate date received and what document (RFI, CB, CO, etc.) caused the change.
    c. The Plan Set shall be available at anytime for easy reference during progress meetings and for emergency location information of new work already completed.
2. The Master As-Built Specification Set (Spec Set) shall begin with one complete bid set of specifications and any additional specifications that were supplied by published addenda during the bidding process. The Spec Set shall be provided in three “D” ring type binders of sufficient thickness to accommodate the specification set. Multiple binders are allowed as necessary. Label the front cover and binding edge with

"Master As-Built Specifications" in bold red letters. Provide other information as necessary to distinguish the contents of multi-volume sets.

a. The Spec Set shall be kept dry, legible, and in good condition at all times.
b. The Spec Set shall be kept up to date with new revisions within two (2) working days of supplemental drawings being issued.
c. The Spec Set shall be available at anytime for easy reference during progress meetings.

3. Other Document Sets may be kept at the GCs option in three "D" ring type binders of sufficient thickness to accommodate the documentation. Other documentation sets may include but not be limited to RFIs, CBs, COs, etc.

C. The Land Surveyor Sub-Contractor shall be required to use digital surveying for all exterior site surveying, and provide deliverable digital as-builts as specified in Specification 00 31 21 Survey Information. As soon as practical the surveyor shall provide the GC with a preliminary copy of installed buried utilities for inclusion with the plan set in the job trailer. The surveyor shall provide final digital as-builts as per section 3.2 above.

D. All contractors shall be responsible for updating the Plan Set from their field sets at least once per work week. Updates shall include but not be limited to the following procedures:

a. All updates shall be done only in red ink. Place a "cloud" around small areas of correction to call attention to the change.
b. Whenever possible place general work notes, field sketches, supplemental details, photos, and other such information on the reverse side of the preceding sheet. Installation notes including dates shall be kept neatly organized in chronological order as necessary.
c. Accurately locate items on the plan set as follows:
   i. For items that are located as dimensioned provide a check mark or circle indicating the dimension was verified.
   ii. For items that are within 5 feet of the location indicated on the plans leave as shown and:
      - Provide correct dimensions to existing dimension strings or,
      - Accurately locate with new dimension strings
   iii. For items that are more than 5 feet from the location indicated on the plans
      - Accurately draw the items in the new location as installed and,
      - Accurately locate with new dimension strings and,
      - Note that the existing location is void.
d. Include dimensioned locations for items that will be buried, concealed, or hidden in the ground, under floors, in walls or above ceilings.
   i. Dimensions shall be pulled from identifiable building features, not from centers of columns or other buried features.
   ii. When necessary pull more dimensions as needed from opposing directions to properly locate single items.

3.4. AS-BUILT REVIEW AND ACCEPTANCE

A. The GC shall provide the Master As-Built Plan Set to the Project Architect (PA), the City Project Manager (CPM), the Commissioning Agent (CxA) and other design team staff for content review prior to the Progress Payment Milestone indicated in Specification 01 29 76 Progress Payment Procedures. The submitted plan set shall include the digital survey information produced under Section 3.2 above.

1. If the plan set is not approved:
   a. The PA and CPM shall only be required to generalize deficiencies by trade there shall be no requirement or expectation to generate a "punch list" of required corrections.
   b. The GC and Sub-contractors as necessary shall be responsible for inspecting the installation and correcting the drawings as needed.
   c. The GC shall re-submit the plan set for review.
2. If the plan set is approved the PA shall take possession of the plan set to be used in providing the owner with digital CAD record drawings. Upon completion of transferring the information to CAD the PA shall provide the Owner with CAD record drawings, record PDFs, and the Master As-Built Plan Set.

3.5. CHANGES AFTER ACCEPTANCE

A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the PA and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of his/her guarantee.

END OF SECTION

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SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS

PART 1 – GENERAL

1.1. SUMMARY

A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they pertain to City of Madison contract procedures regarding spare parts, special tools, special materials, and extra materials.

B. Each contractor shall be responsible for knowing the specific requirements of their Division Specifications as they may relate to the general information provided in this specification.

C. The General Contractor (GC) shall be responsible for ensuring all contractors provide spare parts and extra materials as described in this specification.

1.2. RELATED SPECIFICAITONS

A. 01 29 76 Progress Payment Procedures

B. 01 31 23 Project Management Web Site (SharePoint)

C. 01 77 00 Closeout Procedures

D. Other Divisions and Specifications that may address more specifically how to proceed with spare parts, special tools, special materials, and extra materials.

1.3. DEFINITIONS

A. Spare Parts: Any component of a product or assembly that comes pre-packaged or was specially ordered for the explicit use of the product or assembly. This shall include but not be limited to fastening devices, mounting brackets, replacement parts, wheels, pulleys, wiring, alternate assembly pieces, etc.

B. Special Tools: Any tool of any kind that was pre-packaged or specially ordered, and is required to be used for the installation or maintenance of an installed product or assembly as part of this contract.

C. Special Materials: Any oil, lubricant, glue, touch-up paint, or other such material that comes pre-packaged or was specially ordered and is required to be used for the installation or maintenance of an installed product or assembly as part of this contract.

D. Extra Materials (Attic Stock): Any surplus materials in new and useable condition that was installed a part of this contract. Attic Stock shall include but not be limited to the following: ceiling tiles, paint, stain, floor coverings, ceramic tiles, light bulbs/lamps, filters, strainers, etc. Attic Stock shall include partially opened bulk items and additional unopened quantities as directed by other specifications.

1.4. PERFORMANCE REQUIREMENTS

A. All contractors shall be responsible for consolidating spare parts, special tools, special materials, and attic stock as it pertains to the specific Work within their Division or Trade.

B. All contractors shall use this specification as a general guideline regarding the requirements for turning spare parts, special tools, special materials, and attic stock over to the owner. Contractors shall explicitly follow specification requirements within their own Division of Trade.

1.5. QUALITY ASSURANCE

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

A. 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 spare parts, extra material, and tool requirements to the GC.

B. The GC shall be responsible for all of the following:
   1. Consolidating all of the sub-contractor lists into one master Checklist.
      a. The checklist shall be in a tabular data format similar to the sample below.

Title	Specification	Item	Specified Quantity	Provided Quantity
AHU-1	23 73 13	Filters Fan belts	1-year supply (12 filters) 1 each size	
CPT-1	09 68 13	2x2 carpet tile	2% unopened	

   2. Upload the completed checklist to the Submittal Library on the Project Management Web Site (SharePoint) 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.

3.2. 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.

3.3. 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.).

3.4. INVENTORY

A. All contractors shall provide the GC with complete inventories of all spare parts, special tools, special materials, and attic stock that they are providing at the end of the contract. The inventories shall be organized as follows:

1. The cover sheet shall indicate the Contractors name, address, phone number, identify that the document is the "Spare Parts and Extra Materials Inventory", and identify the Division or Trade the inventory is for.
2. Provide an inventory in a tabular format of all items being provided under this and other specifications. The minimum information to be provided for each item on the inventory shall be as follows:
    a. Bag or container number, all items of one bag or container shall be grouped together on the inventory
    b. Item description
    c. Item size (if applicable)
    d. Total quantity provided
    e. Identify if item is a spare part, tool, special material, or attic stock

B. The GC shall consolidate inventories from all sub-contractors into one tabular data sheet organized by Division or Trade of Work.
1. Upon completing the consolidated list the GC shall upload the completed inventory to the Contract Closeout-Attic Stock Library on the Project Management Web Site.
2. The GC shall notify the Project Architect and City Project Manager that the scans have been uploaded.
3. Consulting Staff and Owner Staff shall review the inventories prior to Final Review to verify that minimum required quantities have been met. Deficiencies shall be noted and returned back to the GC for corrective action.

3.5. 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.

3.6. CLOSEOUT PROCEDURE

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

END OF SECTION

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SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities and guidelines related to providing Demonstration and Training (D&T) Sessions related to general facility use, equipment, systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as needed.

B. All D&T shall be coordinated through the General Contractor (GC), Project Architect (PA) and City Project Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being trained. New equipment and systems may have complete D&T sessions as described in this specification while equipment or systems staff is familiar with may have sessions more focused on maintenance only.

1.2. RELATED SPECIFICATIONS

A. Section 01 29 76 Progress Payment Procedures
B. Section 01 31 23 Project Management Website (SharePoint)
C. Section 01 78 13 Completion and Correction List
D. Section 01 78 23 Operation and Maintenance Data
E. Section 01 78 36 Warranties
F. Section 01 78 39 As-Built Drawings
G. Section 01 78 43 Spare Parts and Extra Materials
H. Other Divisions and Specifications that may address more specifically the requirements for D&T sessions related to the installation of all items and equipment installed under the execution of the Work.

1.3. QUALITY ASSURANCE

A. All contractors shall have the responsibility of preparing for and conducting D&T sessions as determined by this and other Division or Trade related specifications, Owner Operation and Maintenance Manuals, Use and Care Manuals and other such documentation related to the Work.

B. The GC shall have responsibility for:

1. Ensuring that all contractors required to conduct a D&T session have successfully completed all of the following:
    a. Turned in all required documentation for review and documentation has been approved/accepted prior to scheduling D&T sessions.
    b. Other required documentation as needed is available and ready for use during the D&T session.
    c. All systems have been started, tested, and running as per appropriate specification and/or manufacturers recommendations prior to scheduling D&T sessions.
    d. All contractors are sufficiently prepared for their D&T session
    e. Documents the D&T session including date, time, contractor and company name, attendees and other information regarding the session
2. Organizing the coordination and scheduling of all D&T sessions between all contractors and the appropriate representatives of the Owner. These representatives may include any of the following depending on the Work of the Contract:
    a. Owner – end users

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

A. 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 D&T requirements to the GC.

B. The GC shall be responsible for all of the following:
   1. Consolidating all of the D&T lists into one master D&T Checklist.
      a. The checklist shall be in a tabular data format similar to the sample below.

Title	Specification	Training	Plan Completed	Training Completed
AHU-1	23 73 13	General Operation; Maintenance		
Overhead Door	12 93 00	General Operation; Maintenance		

   2. Upload the completed checklist to the Submittal Library on the Project Management Web Site (SharePoint) 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.

C. The GC shall develop a specific D&T plan to be scheduled and conducted as described below but no sooner than the meeting discussed in 3.2.A.2 below.

D. The GC shall not schedule D&T sessions to preclude required personnel from attending multiple sessions.

3.2. COORDINATING AND SCHEDULING THE TRAINING

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

B. All of the Construction Work shall be operationally ready prior to conducting training as follows:
   1. All contractors shall have their As-Built Drawing Records available for reviewing locations of system components during training.
   2. All final and approved Operations and Maintenance Data shall be completed no less than two (2) full weeks prior to the scheduled training.
   3. All systems shall have been started, functionally tested, balanced, and fully operational, and all piping and equipment labeling complete at least two (2) days prior to the scheduled training.

a. Seasonal equipment shall not be trained out of season. Contractors having seasonal equipment shall work with the GC and CPM for coordinating additional training sessions as appropriate for seasonal equipment.

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

3.3. TRAINING OBJECTIVES

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

B. For each piece of specialty equipment train on the following objectives/topics as applicable:
1. Manufacturers operations instructions
2. Manufacturers use and care instructions
3. Manufacturers maintenance and troubleshooting instructions
4. System operation and programming including weekly, monthly, annual test procedures
5. Identification of any correction list items still outstanding
6. Review of system documentation including the following:
   a. Operation and maintenance data
   b. Warranties

C. End User Orientation
1. Facility walkthrough
2. Security and emergency features
3. General facility operation procedures

D. Facility General Use and Custodial Services – if requested
1. Facility walkthrough
2. Security and emergency features
3. General facility operation procedures
4. Care and maintenance of specialty items, finishes, etc. as requested
5. Attic stock inventory and material designations

3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION

A. Each contractor having a responsibility for providing D&T sessions shall meet with the GC, CPM, and other City Staff as needed to review the extent of the Training Objectives in section 3.3 above needed for each piece of equipment, system, finish, etc. This meeting shall occur no less than four (4) weeks prior to the anticipated training session.

B. The PA and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been met. The PA and CPM will approve the program as submitted or recommend changes for re-submittal as necessary.

3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION

A. All contractors shall conduct their required D&T Sessions as follows:
1. Begin with a classroom session
   a. Provide a sign in sheet indicating all training to be conducted, instructors, etc.
   b. Provide an overview of the training to be conducted including the approximate schedule.
2. Conduct a general walk-through of the site.
   a. Point out locations of various equipment, valves, charts, and other related items.
   b. Use the Division or Trade As-Built record drawings to indicate locations of hidden or buried items.
3. Provide a demonstration of general equipment/system operation including using the O&M manual.

a. Startup and shutdown procedures.
b. Normal operational levels as depicted by any gauges, software, etc.

4. Provide a demonstration of all owner level maintenance using the O&M manual.
   a. Indicate frequency of maintenance.
   b. Provide and review all spare parts, special tools, and special materials.
5. Provide and review all spare parts, special tools, special materials, or attic stock as applicable.
6. While conducting D&T sessions:
   a. Allow hands on training whenever practical.
   b. Answer questions promptly
   c. Repeat demonstrations and procedures as necessary.

B. Within two (2) working days of completing the D&T session the contractor responsible for the session shall turn-in any documentation generated including the sign in roster to the GC.

C. The GC shall turn over all training documentation to the PA and CPM upon completion of D&T sessions.

D. Re-schedule any training that has been determined to be inadequate or inappropriate for any reason including but not limited to any of the following;
1. Unqualified instructor
2. System installation incomplete or untested to the specifications
3. Equipment failure during demonstration
4. Un-expected cancellation

3.6. CLOSEOUT PROCEDURE

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

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Division 01 for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017329 "Cutting and Patching" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.
B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Review procedures for noise control and dust control.
7. Review area of work with Local Fire Marshal and the requirement to leave fire sprinkler system in operation during construction. No demolition can begin without the meeting with the fire marshal first and approval of the fire protection system design.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.
B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and, for noise control. Indicate proposed locations and construction of barriers.
C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building.
6. Submit plan indicating route of taking demolition debris from space to dumpsters.
    a. A path over the lower roof must include the following protection:
        1) Over the existing roof membrane, loose lay 45 mil EPDM over the entire intended demolition material removal pathway. EPDM should extend a minimum of two feet beyond each edge of the completed pathway, which will be a minimum of 8 feet wide. On top of the 45 mil EPDM, loose lay 2-inch-thick extruded polystyrene over the entire intended demolition material removal pathway. The insulation should be a minimum of 8 feet wide. Over the extruded polystyrene, loose lay ¾ inch thick plywood over the entire intended demolition material removal pathway. The plywood will be a minimum of 8 feet wide, with sheets butted tight together. Install continuous 2”x 4” toe boards along both sides of the pathway, “knitting” the plywood sheets together by staggering the joints in the 2 x 4s a minimum of 2 feet from the joints in the plywood. The toe boards should be attached with screws 12’’ on center staggered. Ballast the pathway with a minimum 40 Lb sandbags along each side of the pathway at 4 feet on center

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
E. Pre-demolition Photographs or Video: Submit before Work begins.
F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.
B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 QUALITY ASSURANCE

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

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before building demolition, Owner will remove the following items:

a. All moveable furniture, equipment and other items that are part of the owner's operations. All items left after there move are the responsibility of the contractor to demolish.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

1. Variations will be noted and reviewed by the Architect, but no additional cost requests will be accepted for those varying conditions.

D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation of asbestos is to be completed by owner under separate contract.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.
F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

1. There are no Existing warranties known of at this time. If contractor suspects warranties are being affected they shall notify architect immediately before proceeding with work

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

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

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

1. Contractor to coordinate with owner's asbestos removal contractor to expose areas of building needed for abatement work.

F. The existing paint in the building contains lead. The asbestos /lead report is available upon request. Contractor to remove and dispose of according to local regulations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL/PLUMBING/FIRE PROTECTION SYSTEMS

A. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical/plumbing/fire protection systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Equipment to Be Removed: Disconnect and remove services from equipment (i.e. all electrical, mechanical, telecom, or plumbing connections to the equipment) all the way back to the source. Cap or plug services at that point and remove equipment.
    c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

B. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with freight elevator, roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01
2. Coordinate with Dane County Facility Maintenance the limitations for use and access to the Freight elevator in building.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

C. Removed and Salvaged Items:

1. Clean salvaged items indicated in the drawings.
2. Turn items over to owner.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 024119

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Wood blocking and nailers.
   2. Wood furring.
   3. Plywood backing panels.

B. Related Requirements:

   1. Section 092216 “Non-Structural Metal Framing”

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Submittals:

   1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

2. Certificates: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Certified Wood: Wood products certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 **for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground**.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

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

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
1. Wood blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Screws for Fastening to Metal Framing: **ASTM C 1002 or ASTM C 954**, length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on **ICC-ES AC01**, **ICC-ES AC58**, **ICC-ES AC193**, or **ICC-ES AC308** as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

A. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

B. Stainless-Steel Sheet: ASTM A 666, Type 316.

1. Use for exterior locations and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch .

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate and Solid Surface faced architectural casework and cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Casework & cabinet hardware.
4. Plastic Laminate Shelves, standards & brackets.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123661 ”Solid Surface Countertops”

1.3 DEFINITIONS

A. Exposed Surfaces of Casework/Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors

B. Semi exposed Surfaces of Casework/Cabinets: Surfaces behind opaque doors or drawer fronts, including interiors faces of doors, interiors and sides of drawers, and tops and bottoms of wall cabinets.

C. Concealed Surfaces of Casework/Cabinets: Surfaces not usually visible after installations, including sleepers, web frames, dust panels, bottoms of drawers, and ends of cabinets and tops of wall cabinets installed directly against and completely concealed by walls, or other cabinets, and utility cabinets.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product, including, panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

B. SUSTAINABLE SUBMITTALS:

1. Certificates: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets installed in architectural plastic-laminate cabinets.

D. Samples for Initial Selection:

1. Plastic laminates.
2. Solid Surface
3. PVC edge material.

E. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish and specified edge material applied to one edge.
2. Wood-grain plastic laminates, 24 by 24 inches, for each type, pattern and surface finish and specified edge material applied to one edge.
3. Corner pieces as follows:

    a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.
4. Solid Surface, 8 by 10 inches, for each type, color, pattern, and surface finish and specified edge material applied to one edge.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1. Provide information for fabricator indicating compliance with requirements under quality assurance section.

B. Product Certificates: For each type of product.

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Adhesives.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that has been in business for a minimum of 15 years, Has a minimum of 10 similar projects of same size, complexity and quality, and has experience in fabricating casework to AWI standards.

B. Installer Qualifications: Fabricator of products.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical plastic-laminate and solid surface faced cabinets.

2. Mockup shall be sized to show materials, quality of construction, cabinetry joints, finishes, and overall appearance of final product. Size of mockup and extent to be determined by architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE AND SOLID SURFACE FACED ARCHITECTURAL CASEWORK/CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Institute” or “Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

D. Type of Construction: Frameless.

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. See Drawings room finish schedules

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: PVC edge banding, 0.12 inch (3mm) thick, matching laminate in color, pattern, and finish.
5. Pattern Direction:
   a. Vertically for drawer fronts, doors, and fixed panels, unless indicated otherwise. Verify with architect in writing prior to fabrication

H. Solid Surface Materials

1. Homogeneous solid sheets of filled plastic resins complying with ISSFA-2 / ANSI SS.

2. Type: Standard type, unless special purpose type is indicated.

3. Thickness: minimum 1/2 inch thick

4. See specifications section 123661 “Solid Surface Countertops” for additional info.

I. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3mm) thick, matching laminate in color, pattern, and finish.

2. Drawer Sides and Backs: 1/2 inch Solid-hardwood lumber.
3. Drawer Bottoms: 1/4 inch Hardwood plywood.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Cabinet End Construction: 1/2 inch Thick plywood, with rabbeted and mortised joints to other components

L. Cabinet Tops and Bottoms: 1/2 inch Thick plywood fully supported by and secured in rabbets in end panels, front rail, and back rail.

M. Back, Top, and Bottom Rails: 3/4 inch by 2-1/2inch solid wood interlocking with end panels and rabbeted to receive top and bottom panels. Back Rails secured under pressure with glue and with mechanical fasteners.

N. Wall Hung Unit Back Panels: 3/16 inch thick plywood fastened to rear edge of end panels and to top and bottom rails.

O. Base Unit Back Panels: 3/16 inch thick plywood fastened to rear edge of end panels and to top and bottom rails.

P. Front Frame Drawer Rails: 3/4 inch by 1-1/4inch solid wood mortised and fastened into face frame.

Q. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

R. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

S. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

2. Harwood Lumber: Kiln Dried to 7 percent moisture content

3. Softwood Lumber: Kiln Dried to 10 percent moisture content

B. Composite Veneered Core Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Softwood Plywood: DOC PS 1.

a. Grading Marking:

1) Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control of the quality of the plywood

2) The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PSI.

b. Plywood, 13mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.

c. Plastic Laminate Shelving Plywood Cores:
1) Interior types, any species group.
2) Veneer Grade: A-B or B-C

2. Hardwood Plywood: HPVA-HP-1

a. Species of Face veneer shall be as shown or as specified in connection with each particular item.

b. Inside of building:

1) Use Type II (interior) A grade veneer for transparent finish

2) Use Type II (interior) sound grade veneer for paint finish

3. Particle Board: ANSI A208.1, Grade M-2

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware"

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, minimum 135 degrees of opening, self-closing.
   1. Hinge Quantity: Manufacturers Recommendation but not less than the following.
      a. Two hinges: Max door 35.5 inches tall, 24 inches wide, and 19 pounds
      b. Three hinges: Max door 60 inches tall, 24 inches wide, and 38 pounds
      c. Four hinges: Max door 76 inches tall, 24 inches wide, and 56 pounds
      d. Five hinges: Max door 92 inches tall, 24 inches wide, and 75 pounds

C. Back-Mounted Pulls: BHMA A156.9, B02011.
   1. Cabinet Door & Drawer Pulls: Square rectangular pull
      a. Material: Solid die-cast zinc alloy
      b. Finish: Satin Nickel
      c. Dimensions: Length 5-3/8" X Projection 1-3/8"
         1) Center to Center Screw Spacing: 5"
      d. Weight 3.9oz
      e. Design basis: Match Gliderite hardware 87227-SN
         1) https://www.gliderite.com/87227-sn-5-cc-solid-square-cabinet-bar-pull-satin-nickel-pack-of-10/

D. Catches: Magnetic catches, BHMA A156.9, B03141.
   1. Provide one at every cabinet door, typical

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.

F. Drawer Slides: BHMA A156.9.

   1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
   2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
   3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
   4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
   5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
   6. For computer keyboard shelves, provide Grade 1HD-100.
   7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

G. Door Locks: BHMA A156.11, E07121.
   1. All cabinet locks must be provided with interchange able cores to match keying as indicated in 087100 "Door Hardware"

H. Drawer Locks: BHMA A156.11, E07041.
   1. All cabinet locks must be provided with interchange able cores to match keying as indicated in 087100 "Door Hardware"

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

L. Metal Support Brackets: Support brackets for countertops

1. 18" X 24" metal support brackets with 2" X 2" wire management knock outs
2. 11 gauge steel, minimum weight limit of 1,000 lbs per pair of brackets
3. Baked enamel finish with prime coat - color black
4. One bracket is to be provided for every 4'-0" of countertop per location. Provide 2X miscellaneous rough carpentry wood blocking in wall for each bracket.
5. Manufacturer Design Basis: EH-Surface or Inside Wall Mount Counter Support Bracket.
   a. www.rakks.com

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Except as otherwise indicated, Use AWI Custom Grade for Architectural woodwork, and interior millwork/cabinetry for fabrication standards.

C. Plywood shall not be less than 13mm (1/2inch), unless otherwise shown or specified

D. Fabricate member less than 14 feet in length from one piece of lumber, back channeled and molded as shown.

E. Plastic Laminate and Solid Surface Cabinetry, Casework, and Countertop:
1. Fabricate to AWI Custom Grade Construction
2. Factory glued to plywood core, thickness as shown or specified.
3. Use PVC edge banding to match plastic laminate for exposed edging
4. Use drawer slides and drawer pulls on all drawers
5. Use pulls and frameless concealed hinges on all doors
6. Use recessed adjustable shelf standards with shelf rests
7. Use Plastic laminate on all exposed and semi exposed surfaces, unless noted otherwise
8. Use plastic laminate on interior surfaces of cabinetry unless noted otherwise.
9. Provide cut outs for electrical devices and outlets. Coordinate requirements with supplier for contract provided items and with owner for owner provided items.
10. Drill holes in countertops for plumbing fittings in shop. Coordinate required holes with supplier of fixtures and accessories to assure proper fit and function before drilling.
11. All solid surface shall be a minimum of 1/2 inch on surfaces and adhered to a minimum 1/2 inch plywood substrate behind.
    a. Fabricate as shown with shop applied edges of materials and configurations indicated.
    b. See specification section 123661 “Solid Surface Countertop” for additional info

c. All exposed edges shall be built up to a minimum 1 ½" inch thickness with square eased edges for a minimum width of 3 inches unless indicated otherwise.
d. Fabricate all areas in one piece. Comply with solid surfaces material manufactures written recommendations for adhesives, sealers, fabrication and finishing.

F. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

G. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.
1. Meet AWI Custom Grade Requirements

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches .

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with either
a. No. 10 wafer-head screws sized for not less than **1-1/2-inch** penetration into wood framing, blocking, or hanging strips

b. No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish
c. toggle bolts through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Adjust all cabinets' doors and drawers for uniform spacing of all joints and smooth operation without rubbing on other surfaces.

C. Clean, lubricate, and adjust hardware.

D. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION 064116

SECTION 064200 - WOOD WALL & CEILING SYSTEM

PART 1 — GENERAL

1.1 Description of Work:

A. Work Included: Provide Linear Closed wood wall and ceiling system where shown on architectural drawings, and as specified in this specification.

1.2 Quality Assurance:

A. Linear Closed wood wall and ceiling system for this project shall maintain the quality as instituted by the architect or A.W.I.

B. Design Criteria: Manufacture of Linear Closed wood wall and ceiling system shall be installed true and plumb to within manufacturing tolerance of 1/8" within 8' of length.

C. Product Construction: Wood shall be kiln dried to 10%. Cracking, checking and warpage of members will not be acceptable.

1.3 Submittals:

A. Technical Data: Submit manufacturer's data and installation instructions.

B. Shop Drawings: Submit 4 copies of shop drawings showing all areas involved, attachment conditions and perimeter circumstances.

C. Submittal Sample: Submit 1 product sample for approval by architect.

1.4 DELIVERY, STORAGE AND HANDLING

A. Material must be stored and installed only in secured ambient environment (humidity min. 25% - max. 55%, temperature not to exceed 86 degrees).

B. Windows, doors and all wet-work must be completed before unpacking and installation. Handle carefully to avoid damage.

PART 2 — PRODUCTS

2.1 Manufacturer:

A. DESIGN BASIS:

1. ARCHITECTURAL COMPONENTS GROUP, INC. 521 George St., Marshfield, MO 65706
2. Phone (417) 869-6777 Fax (417) 869-7888

2.2 Product Type

A. Design Basis Product Configuration: Linear Closed Series 1 wood system product: LC1-375-C
(LW-1 as indicated on dwg)

Nomenclature for LC1-375-C:
LC1 = Linear Closed Series 1
325 = 3-3/4" wide
C = 3/4" thick plank
Square Reveal profile = D

B. Wood planks shall be provided in a size of: 3 3/4" wide x 3/4" thick.

C. Wood plank length shall be random length up to 10' length (if solid wood) *or* 8' and/or 10' length (if veneer).

D. Wood Specie: System shall consist of desired solid wood or veneer; wood species.

1. Final Species to be selected by architect from manufacturers full range to allow the stain color to match the architects sample.

E. Finish: Wood finish shall utilize ACGI clear finish with satin sheen or specify stain to match architect sample. Back of planks shall be factory sealed.

1. Provide a custom Stain color that must match architects sample. Image of sample is available upon request.

F. Certification: If **solid** wood, wood shall be FSC certified. If wood **veneer**, wood veneer shall be FSC certified, and the **core** material shall be FSC certified. FSC, Chain of Custody shall be provided.

G. NAUF: If veneer, substrate material shall be manufactured with no added urea formaldehyde.

H. Fire Rating: Panels shall achieve a *Class I(A)* Fire Rating.

I. Attachment System: Linear Wood Wall and Ceiling System shall be suspended according to manufacturer's suggested method of suspension as per the design details provided by manufacturer.

PART 3 — EXECUTION

3.1 Installation

A. Linear wood wall and ceiling system shall be handled and installed with care in order to prevent surface and structure damage. Field cutting shall be kept to a minimum and performed as recommended by manufacturer.

B. The contractor shall suspend panels in accordance with manufacturer's recommended installation guides and shop drawings

C. The ceiling system shall be suspended by 15/16" black HD T-grid with main runners on 2' centers and cross T's every 4' or per metal stud framing as indicated in drawings.

D. The wall system shall be installed on 7/8" furring channels minimum 24" o.c. attached to metal stud partition framing. Provide 4" wide metal strapping 24" o.c. on metal stud partition behind GWB to provide backing material for furring channels attachment.

E. Panels shall be installed by screwing LSC-101 and LSC-102 clips (or other manufacturers recommended clips) into the furring strips (wall) or T-Grid (ceiling) and attaching the wood members in accordance to the manufactures' installation instructions. LSC-103 alignment clips (or other manufacturers recommended clips) shall be used at plank joints.

F. Contractor shall clean all panels prior to installation according to manufacturer's recommended maintenance procedures. Upon completion of installation, panels shall be inspected and cleaned as needed.

PART — 4 WARRANTY

4.1 Product Warranty

A. Manufacturer shall warranty the Linear wood wall and ceiling system against manufacturer's defects up to one year. Changes in finish or dimensions due to ultra violet light, excessive temperature or humidity conditions and/or abuse of any kind shall void any warranties from manufacturer.

B. Install conditions for the area should remain for the proper occupied conditions of humidity and temperature (humidity min. 25% - max. 55%, temperature not to exceed 86 degrees).

C. The contractor shall warranty for one year all work from final acceptance of completed work.

END OF SECTION 064200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg .

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg .

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items

or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet .

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Contractor shall engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. All penetrations in fire rated walls and horizontal assemblies are to receive a UL rated firestopping system.

1. UL-Classified Systems: As indicated in drawings and as required per field conditions Penetration Firestopping Systems with No Penetrating Items:

2. UL-Classified System: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing:

3. UL-Classified Systems: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:

4. UL-Classified Systems: As indicated in drawings and as required per field conditions Penetration Firestopping Systems for Electrical Cables:

5. UL-Classified Systems: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Cable Trays with Electric Cables:

6. UL-Classified Systems: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Insulated Pipes:

7. UL-Classified Systems: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants:

8. UL-Classified Systems: As indicated in drawings and as required per filed conditions. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants:

9. UL-Classified Systems: As indicated in drawings and as required per field conditions. Penetration Firestopping Systems for Groupings of Penetrants:

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
2. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.1: For joint firestopping system sealants, documentation including printed statement of VOC content.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content:

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.

3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Contractor shall engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. All Joints in or between fire-resistance-rated constructions are to receive a UL rated firestopping system.

1. UL-Classified Systems: As indicated in drawings and as required per field conditions Floor-to-Floor, Joint Firestopping Systems:

2. UL-Classified Systems: As indicated in drawings and as required per field conditions Wall-to-Wall, Joint Firestopping Systems:

3. UL-Classified Systems: As indicated in drawings and as required per field conditions Floor-to-Wall, Joint Firestopping Systems:

4. UL-Classified Systems: As indicated in drawings and as required per field conditions Head-of-Wall, Fire-Resistive Joint Firestopping Systems:

5. UL-Classified Systems: As indicated in drawings and as required per field conditions Bottom-of-Wall, Joint Firestopping Systems:

6. UL-Classified Systems: As indicated in drawings and as required per field conditions Perimeter Joint Firestopping Systems:

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

B. Related Sections:

1. Section 092900 "Gypsum Board" for sealing perimeter joints.
2. Section 093013 "Ceramic Tiling" for sealing tile joints.
3. Section 095123 "Acoustical Tile Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. 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.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. 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.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

C. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

D. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

E. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

F. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

C. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

D. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion

and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.
b. Whether sealant dimensions and configurations comply with specified requirements.
c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

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

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.

1. Joint Locations:

    a. Joints in pedestrian plazas or areas that have a concrete topping over rigid insulation and water proof membrane.
    b. Other joints as indicated.

2. Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between metal panels.
    d. Joints between different materials.
    e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    f. Control and expansion joints in overhead surfaces.
    g. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Control and expansion joints in tile flooring.
    c. Other joints as indicated.

2. Urethane Joint Sealant: Single component, nonsag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
e. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints.
b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches .
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings **and temperature-rise limits** indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. For all hollow metal doors and frames indicated in the door and frame schedule..

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches
    c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch .
    d. Edge Construction: Continuously welded with no visible seam.
    e. Core: Steel stiffened.
3. Frames:
    a. Materials: Uncoated steel sheet, minimum thickness of 0.067 inch .
    b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. For all Hollow Metal doors and frames indicated in the door and frame schedule..

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches
    c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch , with minimum G60 A60 coating.
    d. Edge Construction: Continuously welded with no visible seam.
    e. Core: Steel stiffened.
        1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Thermally Broken Frames:
    a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch , with minimum G60 A60 coating.
    b. Construction: Full profile welded.
    c. Manufacturers available to be provided.
        1) CECO Door Products - Thermal Break SQT and SRT Series

2) Curries Company - Thermal Break M and C Series

4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch , and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches , as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch , steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with flush end closures of same material as face sheets.
6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

    b. Compression Type: Not less than two anchors in each frame.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

8. Provide conduit within door frame for pathway for wiring of all current and future electronic hardware.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
3. Provide conduit within door frame for pathway for wiring of all current and future electronic hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch , measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch , measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch , measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch .
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch .
c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch .
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch .

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 08 13 70
INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND OFFICEFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Interior, 1-3/4", top hung aluminum-framed and wood framed sliding doors

1.2 RELATED SECTION

A. Section 08 1416 – Flush Wood Door

1.3 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

D. Samples: Submit manufacturer's samples of the following sliding door components:

1. Door veneer or laminate sample
2. Aluminum Frame finish sample

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Warranty Documentation: Submit manufacturer's standard warranty.

G. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.

B. Source: Obtain sliding aluminum framed doors and hardware from single source.

C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.5 REFERENCES

A. ANSI – American National Standards Institute

1. ANSI 156.18 Materials and Finishes
2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.

B. BHMA – Builders Hardware Manufacturers Association

C. DHI – Door and Hardware Institute

D. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 101 – Life Safety code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Doors Assemblies

E. AWS – Architectural Woodwork Standards

1.6 PERFORMANCE

A. Aluminum perimeter frames with integral acoustic seals

B. Soft self-closing mechanism integrated with top track

C. Concealed door guide

1.7 DELIVERY: STORAGE AND PROTECTION

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Notify manufacturer immediately of any shipping damage.

C. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Store materials in clean, dry area indoors.
4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Acceptable manufacturers include but is not limited to the following design basis.

1. **Design Basis: AD SYSTEMS** 2201 100th St. SW, Everett, WA 98204 | Website: http://specADsystems.com | Phone: 425-374-1360 | Attn: Estimating: estimating@specADsystems.com
2. Other manufacturers meeting the standards of the design basis.

2.2 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

A. Interior Aluminum-Framed Top-Hung Sliding Doors: Model: AD Systems High Performance Sliding Door System by AD Systems.

B. Specified Wall Thickness: As indicated in drawings / Verify in field

C. Officefront Frame Profiles: Extruded aluminum frame “wrap” frame with integral vertical jamb (stile pocket).

1. Profile Dimensions:

a. U-Channel Head & Sill or as required per field condition.

2. Finish:

a. Provide manufacturers standard Anodized Aluminum Finish. Meets AAMA 2604 Standard Colors: As selected by Architect.

D. Door Leafs. All Doors to be factory machined for hardware including pilot and function holes.

1. 1-3/4" Flush Wood Door: Solid Timber-Strand Core or Solid Particle Core. Match veneer as indicated in 081416 Flush Wood Doors or as selected by architect from manufacturers full line

E. Door Components:

1. Single Top Track: AD Systems extruded aluminum track by AD Systems
2. Valances: Extruded aluminum with integral end caps

a. Standard square valance

3. Top Rollers: tandem nylon roller sized to match door weight
4. Concealed Floor Guide: Integral Jamb floor guide by AD Systems
5. Soft-Closer: Soft and self-closing damper mechanism at both sides of door leaf
6. Handles:

a. AD Systems Standard Straight Pull: 16” long x 1” diameter. Finish: US32D Satin Stainless Steel

F. Accessories:

1. Self-Closing Spring Mechanism
2. Automatic Door Bottom for improved acoustical performance

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.

B. Verify dimensions of wall openings.

C. Examine surfaces to receive top and bottom guide.

D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.

E. Do not begin installation until unacceptable conditions are corrected.

F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.2 INSTALLATION

A. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Install sliding doors plumb, level, square, and in proper alignment.

C. Install sliding doors to close against walls without gaps

D. Install sliding doors to open and close smoothly.

E. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

3.3 ADJUSTING

A. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.

B. Adjust sliding doors to operate smoothly without binding.

C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

3.4 CLEANING

A. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.5 PROTECTION

A. Protect installed sliding doors from damage during construction.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
1. None

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction**, louvers,** and trim for openings. **Include factory-finishing specifications.**

B. Sustainable Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that flush wood doors comply with forest certification requirements. **Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body.** Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. **For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.**
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
    a. Provide Samples for each species of veneer and solid lumber required.
    b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in **plastic bags or cardboard cartons**.

C. Mark each door on **top and** bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with **AWI's, AWMAC's, and WI's "Architectural Woodwork Standards or WDMA I.S.1-A, "Architectural Wood Flush Doors**."

B. Certified Wood: Flush wood doors shall be certified as "FSC Pure" **or "FSC Mixed Credit"** according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

C. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

D. WDMA I.S.1-A Performance Grade: **Heavy Duty**.

E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to **NFPA 252** or **UL 10C**.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: **At vertical exit enclosures and exit passageways**, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
5. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

F. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

G. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

H. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as **needed to eliminate through-bolting hardware.**

a. 5-inch (125-mm) top-rail blocking.
b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
d. **4-1/2-by-10-inch (114-by-250-mm) lock blocks and 5-inch (125-mm) midrail blocking**, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

a. Screw-Holding Capability: **550 lbf (2440 N)** per WDMA T.M.-10.

2.2 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors (WD):

1. Grade: Premium, with Grade A faces.
2. Species: **Red oak or White oak**.
3. Cut: **Rift cut**.
4. Match between Veneer Leaves: **Book or Slip** match.
5. Assembly of Veneer Leaves on Door Faces: **Center-balance** match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Vertical **and Top** Edges: **Same species as faces or a compatible species - edge Type A**.
8. Core: Either glued wood stave or structural composite lumber.
9. Construction: **Five or seven** plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
10. WDMA I.S.1-A Performance Grade: **Heavy Duty**.

2.3 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: **Same species as door faces**.
2. Profile: **Flush rectangular beads**.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.4 FABRICATION

A. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber**, rabbeted,** meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on **top and** bottom edges, edges of cutouts, and mortises.

B. Factory finish all doors.

C. Transparent Finish:

1. Grade: **Premium**.
2. Finish: **WDMA TR-6 catalyzed polyurethane**.
3. Staining: **Match Architect's sample**.
4. Effect: **Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores**.
5. Sheen: **Satin**.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see **Section 087100 "Door Hardware.**

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall.
   a. Provide at all locations in masonry walls
3. Door Size: As coordinated in field
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch , 16 gage.
   a. Finish: Factory prime.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

C. Flush Access Doors with Concealed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
   a. Provide at all locations in Gypsum wall board
3. Door Size: As coordinated in field
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch , 16 gage.
   a. Finish: Factory prime.
5. Frame Material: Same material and thickness as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

D. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall.
   a. Provide at all locations in masonry walls
3. Door Size: As coordinated in field
4. Fire-Resistance Rating: Not less than that of adjacent construction.
5. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch , 20 gage.
   a. Finish: Factory prime.
7. Frame Material: Same material, thickness, and finish as door.
8. Hinges: Manufacturer's standard.
9. Hardware: Lock.

E. Hardware:

1. Latch: Self-latching bolt operated by flush key with interior release.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame 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. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frame for attachment of masonry anchors.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

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

END OF SECTION 083113

SECTION 084126 - ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. All-glass **sidelights, transoms, entrances, and storefronts**.

B. Related Requirements:

1. None.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: For all-glass entrances and storefronts.

1. Include plans, elevations, and sections.
2. Include details of fittings and glazing, including isometric drawings of patch fittings and rail fittings.
3. Door hardware locations, mounting heights, and installation requirements.
4. Review and coordinate hardware with Keyscan Equipment. Detail complete operation sequence in shop drawing.

C. Samples for Initial Selection: For each type of exposed finish indicated.

D. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer registered in the State of Wisconsin responsible for their preparation. This includes the design of additional cold formed metal framing within metal stud framing to account for all glass entrances and storefront loads.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Special Warranty: **Installer** agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period of at least ten years.

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

a. Structural failures including excessive deflection.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Failure of operating components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the state of Wisconsin, as defined in Division 01 requirements to design all-glass entrances and storefronts.

B. The components listed in this specification section is not meant to be all inclusive, it is the responsibility of the contractor to ensure that during bidding and during construction provide all the needed and correct components for the all glass entrance system and storefronts, including doors, to be fully functional and operational.

C. General Performance: Comply with performance requirements specified, as determined by testing of all-glass entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

D. Structural Loads:

1. Wind Loads: None.
2. Other Design Loads: **As required per field condition**.
3. Deflection Limits: Deflection normal to glazing plane is limited to **1/175 of clear span or 3/4 inch (19 mm), whichever is smaller**.

E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL COMPONENTS

A. Fitting Configuration:

1. All-Glass Storefronts: Continuous rail fitting at top and bottom, with overhead door header.

B. Patch Fittings:
1. Material: Stainless-steel.
2. Finish: US32D

C. Rail Fittings:

1. Material: Match patch-fitting metal and finish.
2. Height:

a. Top Rail: **2 inches, unless noted otherwise**.
b. Bottom Rail: **2 inches, unless noted otherwise**.

3. Profile: **Square**.
4. End Caps: Manufacturer's standard precision-fit end caps for rail fittings.

D. Accessory Fittings: Match **patch- and rail-fitting** metal and finish for the following:

1. Overhead doorstop.
2. Center-housing lock and latch keeper.

E. Anchors and Fastenings: Concealed.

F. Weather Stripping: Pile type; replaceable without removing all-glass entrance doors from pivots.

G. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.

a. Color: As selected by Architect from full range of industry colors and color densities, including anodized finishes.

2. Stainless-Steel Cladding: ASTM A 666, Type 304.

a. Finish: No. 4 directional satin finish.

2.3 GLASS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Glass Type GL-1
a. Class 1: Clear monolithic.
1) Thickness: 3/8 inch (10 mm).
2) Locations: all locations and as indicated as GL-1.
b. Exposed Edges: Machine ground and flat polished.
c. Butt Edges: Flat ground.
d. Corner Edges: Lap-joint corners with exposed edges polished.

2.4 ENTRANCE DOOR HARDWARE (Reception and Larger Conference Room – HG 1.0)

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of **patch fittings** and **rail fittings**.
   1. At double doors provide all these items on both door leafs.

B. Top and bottom rails at sidelights.
   1. Top rail to match overhead door header in size and profile for continuous look.
   2. Bottom rail to be nominal 1” X 1” square U channel.

C. Push-Pull Set: Both sides of door provide 36” tall Ladder pulls centered in height of door.
   1. Rockwood Door Pull RM 2210 in US32D finish

D. Overhead door header with concealed closer, concealed magnetic lock, and top pivot.
   1. Concealed Closer: Design basis Rixson 609
   2. Magnetic lock to tie into card reader system, see electrical for more information.
      a. Manufacturers standard magnetic lock with minimum 1500lbs holding force.
   3. Provide conduit inside header with pull string to allow install of wiring for card reader and panic exit button to release magnetic lock. Coordinate required size with Electrical contractor.
   4. Provide recessed flush wall mounted Push button exit for magnetic lock. Provide only at door 507F-1. Coordinate final location with Architect.

E. Door top rail, bottom rail, and bottom pivot.
   1. Door bottom rail to have dead bolt lock with interchangeable cores, keyed from both sides.
   2. Door top rail to be 4” tall with door bottom rail 10” tall
   3. Provide door position switch connected to automatic door operator.

F. Cylinders: **As specified in Section 087100 "Door Hardware." Or Six-pin cylinder, BHMA A156.5, Grade 1.**
   1. Coordinate with owners current keying system.

G. Threshold: None

2.5 ENTRANCE DOOR HARDWARE (Suite Entrance Door into Reception – HG 1.1)

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of **patch fittings** and **rail fittings**.
   1. At double doors provide all these items on both door leafs.
      a. Except automatic door operator is only to be on one door leaf.

B. Top and bottom rails at sidelights.
   1. Top rail to match overhead door header in size and profile for continuous look.
   2. Bottom rail to be nominal 1” X 1” square U channel.

C. Push-Pull Set: Both sides of door provide 36” tall Ladder pulls centered in height of door.
   1. Rockwood Door Pull RM 2210 in US32D finish

D. Overhead door header with concealed closer, automatic door operator, push button actuator, and top pivot.
   1. Automatic Door operator: Design basis Norton 5710
      a. Mount on wall above door push side operator arm to mount or door head rail.
   2. Push button actuator: BEA, inc. LPR36 full-length, 36 inch high -low actuator
      a. Integrate to use with selected automatic door operator
      b. Integrate with Door position switch so auto opener does not activate with locked door.
   3. Provide conduit inside header with pull string to allow install of wiring for door operator and push button actuator. Coordinate required size with Electrical contractor.

E. Door top rail, bottom rail, and bottom pivot.

1. Door bottom rail to have dead bolt lock with interchangeable cores, keyed from both sides.
2. Door top rail to be 4” tall with door bottom rail 10” tall
3. Provide door position switch connected to automatic door operator.

F. Cylinders: **As specified in Section 087100 "Door Hardware." Or Six-pin cylinder, BHMA A156.5, Grade 1.**
1. Coordinate with owners current keying system.

G. Threshold: None

2.6 CONFERENCE ROOM DOOR HARDWARE (Conference / Huddle Room Doors – HG 2.0)

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of **patch fittings** and **rail fittings**.

B. Top and bottom rails at sidelights.
1. Top rail to match overhead door header in size and profile for continuous look.
2. Bottom rail to be nominal 1” X 1” square U channel.

C. Push-Pull Set: Both sides of door provide 36” tall Ladder pulls centered in height of door.
1. Rockwood Door Pull RM 2210 in US32D finish

D. Overhead door header, with concealed closer, and top pivot.

E. Door top rail, bottom rail, and bottom pivot.
1. Door top rail to be 4” tall with door bottom rail 10” tall

F. Threshold: None

2.7 OFFICE AND DIRECTOR DOOR HARDWARE (Director / Office Room Doors – HG 3.0)

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of **patch fittings** and **rail fittings**.

B. Top and bottom rails at sidelights.
1. Top rail to match overhead door header in size and profile for continuous look.
2. Bottom rail to be nominal 1” X 1” square U channel.

C. Overhead door header, with concealed closer, and top pivot.

D. Door top rail, bottom rail, and bottom pivot.
1. Door top rail to be 4” tall with door bottom rail 4” tall

E. Single-Door and Active-Leaf Locksets: **Center-housing combination deadlatch and latchbolt with lever handles**.

1. Provide Center lock patch housing for Mortised Lock set on active glass door leaf
   a. Dead latch with passage function
2. Provide Center Lock Housing for Center Patch Keeper on fixed glass leaf

F. Threshold: None

2.8 BUTT-GLAZING SEALANTS

A. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses NT, G, and A.

B. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

2.9 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level, plumb, and true to line, with uniform joints.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

F. Install butt-joint sealants according to manufacturer's instructions and as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084126

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “All Glass Entrances and Storefronts”.
4. Division 26, 27, & 28 Section for rough-ins.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.

4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:

a. Ives (IV)
b. Bommer Industries (BO).
c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
d. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:

a. Bommer Industries (BO).
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12" removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

a. Bommer Industries (BO) - SER-QC (# of wires) Option.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - SER-QC (# wires) Option.
c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) - SER-QC (# wires) Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.

b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Acceptable Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Acceptable Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Acceptable Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Acceptable Manufacturers:

a. Hiawatha, Inc. (HI).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Dane County Facility uses a 7 pin Best/Marshall Best core with a “L” keyway.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified cylinders employing a utility patented and restricted keyway requiring the use of patented controlled keys. Provide bump resistant, fixed core cylinders as standard with solid recessed cylinder collars. Cylinders are to be factory keyed where permanent keying records will be established and maintained.

1. Provide a 7 pin multi-level master key system comprised of patented controlled keys and security and high security cylinders operated by one (1) key of the highest level. Geographical exclusivity to be provided for all security and high security cylinders and UL437 certification where specified.

2. Acceptable Cores / Keyways:
    a. Dane County Facility uses a 7 pin Best/Marshall Best core with a “L” keyway.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

G. Construction Keying: Provide construction master keyed cylinders.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body. The locksets must fit Dane county standard keyway listed previously.

1. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) – ML2000 Series.
    b. Sargent Manufacturing (SA) – 8200 Series.
    c. Schlage (SC) – L9000 Series.

B. Knurling: Where required by local code provide knurling or abrasive coating to all levers on doors leading to hazardous areas such as mechanical rooms, boiler and furnace rooms, janitor closets, and as otherwise required or specified.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure except door 507S-1.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.

4. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) - ML20900 Series.
    b. Sargent Manufacturing (SA) - 8200 Series.
    c. Schlage (SC) - L9000 EL/EU/RX Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 ELECTRIC STRIKES

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Acceptable Manufacturers:

a. Folger Adam EDC (FO).
b. HES (HS).

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Stanley Precision (PR) - Apex 2000 Series.

2.11 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door

size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) – DC6000 Series.
    b. Sargent Manufacturing (SA) - 351 Series.
    c. Norton Door Controls (NO) - 7500 Series.

2.12 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

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

1. LCN Closers (LC) - 4640 Series.
2. Norton Door Controls (NO) - 6000 Series.
3. Stanley Security Solutions (ST) – D-4990 Series.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Acceptable Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

    a. Rixson Door Controls (RF).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

A. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

1. Acceptable Manufacturers:

    a. Security Door Controls (SD) - MD-31D Series.
    b. Securitron (SU) - XMS Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers:

    a. Security Door Controls (SD) - DPS Series.
    b. Securitron (SU) - DPS Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted

items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Hardware Sets

Set: AC1.2

Description: CR x Rated Interior Door, Clo/Stop (Door 507A-1, 507Y-1, 507H-1)

2	Hinge	TA2714 NRP	US26D	MK
1	Hinge - ETW	TA2714 QC12	US26D	MK
1	Fail Secure Electric Lock	DG1 RX 8271-24V LW1L	US26D	SA
1	Electric Strike			
1	Door Closer x Stop	CPS7500	689	NO
1	Kick Plate	K1050 8" BEV CSK	US32D	RO
1	Gasketing	S88BL		PE
1	Frame Wire Harness	QC-C1500P		MK
1	Door Position Switch	DPS-M / W-GY		HD
1	Door Wire Harness	QC-Cxxx (length as req'd)		MK
1	Card Reader	By Security Contractor		HD

Notes: Door is normally closed and locked.
Valid card read unlocks electric strike for entry.
Strike is fail secure - locked on fire alarm or loss of power.
Free egress at all times.

Set: 1.2

Description: Storeroom x Closer (Not Used)

3	Hinge	TA2714 NRP	US26D	MK
1	Storeroom Lock	DG1 8204 FEL	US26D	SA
1	Door Closer	7500 (Reg / PA)	689	NO
1	Wall Stop	401	US26D	RO
1	Gasketing	S88BL		PE

Set: 2.1

Description: Office (Door 507C-1, 507Z-1)

3	Hinge	TA2714	US26D	MK
1	Office Lock	DG1 8205 FEL	US26D	SA
1	Wall Stop	401	US26D	RO

Set: 5.0

Description: Passage (not used)

3	Hinge	TA2714	US26D	MK
1	Passage Set	8215 LW1L	US26D	SA
1	Wall Stop	401	US26D	RO

Set: 10.3

Description: Rim Exit - Storeroom, Rated (Door 507S-1) (Fail safe, power off, unlocks lever)

2	Hinge	TA2714 NRP	US26D	MK
1	Hinge - ETW	TA2714 QC12	US26D	MK
1	Rim Exit NL, ELR, RX)	DG1 55 56 AD8573	US32D	SA
1	Door Closer	7500 (Reg / PA)	689	NO
1	Kick Plate	K1050 8" BEV CSK	US32D	RO
1	Wall Stop	401	US26D	RO
1	Door Position Switch	DPS-M / W-GY		HD
1	Gasketing	S88BL		PE

Set: 12.0

Description: Cylinders for Hardware provided in other specification sections

1 Cylinder & Interchangeable Core

Notes: Balance of hardware by All Glass Entrances and Storefront manufacturer.

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2 END OF SECTION 087100

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SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For shaft wall assemblies and firestop tracks, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: 51, minimum or as indicated.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: **0.033 inch minimum unless thicker is required by fire assembly rating or manufacture span tables per field condition.**

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: Matching steel studs.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Room-Side Finish: Gypsum board.

G. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

H. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

C. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.

1. Thickness: 1 inch .
2. Long Edges: Double bevel.

D. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces. *Use these panels types in wet locations, i.e. toilet rooms, kitchens, mechanical rooms, or other areas where water is present or is commonly used.*

1. Thickness: 1 inch .
2. Long Edges: Double bevel.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

E. Gypsum Board: As specified in Section 092900 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board."

F. Acoustical Sealant: As specified in Section 092900 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Cant Panels: At projections into shaft exceeding 4 inches , install 1/2- or 5/8-inch-thick gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 092900 "Gypsum Board"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

   a. Minimum Base-Metal Thickness: minimum to be provided is **0.0312 inch unless thicker is required per fire assembly rating or manufacture span tables per field condition.**
      1) Provide thicker gauge at locations as indicated on drawings where cold formed metal framing is called out.
   b. Depth: **As indicated on Drawings**.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: minimum to be provided is **0.0312 inch unless thicker is required per fire assembly rating or manufacture span tables per field condition.**
      1) Provide thicker gauge at locations as indicated on drawings where cold formed metal framing is called out.
   b. Depth: **As indicated on Drawings**.

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: minimum **0.033 inch**.

G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depth: minimum **1-1/2 inches unless noted otherwise**
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches , 0.068-inch-thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: minimum **0.033 inch unless noted otherwise**
2. Depth: minimum **7/8 inch unless noted otherwise or required by field condition.**

I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: **Asymmetrical** or **hat shaped**.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: minimum **3/4 inch unless noted otherwise or required by filed condition.**
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch .
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches , wall attachment flange of 7/8 inch , minimum uncoated-metal thickness of 0.018 inch , and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. 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.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

    a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.

1. Depth: minimum **2-1/2 inches unless noted otherwise or required by field conditions.**

E. Furring Channels (Furring Members):

1. Steel Studs and Runners: ASTM C 645.
    a. Minimum Base-Metal Thickness: minimum to be provided is **0.0312 inch unless thicker is required per fire assembly rating or manufacture span tables per field condition.**
    b. Depth: **As indicated on Drawings**.

2. Dimpled Steel Studs and Runners: ASTM C 645.
    a. Minimum Base-Metal Thickness: minimum to be provided is **0.0312 inch unless thicker is required per fire assembly rating or manufacture span tables per field condition.**
    b. Depth: **As indicated on Drawings**.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated or required by other standards of construction
2. Multilayer Application: 16 inches o.c. unless otherwise indicated or required by other standards of construction
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated or required by other standards of construction

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   a. Provide additional framing as required at fire rated partitions where it is required by U.L. rated assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Installation must meet international building code seismic requirements for project location.

2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

4. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
3. Section 093010 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.

b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch .
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Gypsum Ceiling Board, Type C: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch .
2. Long Edges: Tapered.

C. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.

1. Core: 5/8 inch , Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch , Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
2. Long Edges: Tapered.

2.5 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Core: 5/8 inch , Type X.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. L-Bead: L-shaped; exposed long flange receives joint compound.
    e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    f. Expansion (control) joint.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 , Alloy 6063-T5.
2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 PARTITION CLOSURE TRIM

A. General: pre-manufactured system from manufacture that will enclose area between gypsum board partition and windows or storefront system. System to include extruded aluminum trim, compressible gasket, and snap covers to conceal fasteners. Finish to match window, storefront, or curtain wall finish. Where required system is to provide same fire ratings of the partition it is attached to.
   1. Design Basis: Mull it Over Products; www.mullitoverproducts.com
      a. 55 Classic
      b. 60 Classic with 1-hour rating

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

   1. Interior Gypsum Board: Paper.
   2. Exterior Gypsum Soffit Board: Paper.
   3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

      a. Use setting-type compound for installing paper-faced metal trim accessories.

   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.
   5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

   1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Abuse-Resistant Type: As indicated in drawings.

B. Moisture and Mold-Resistant Type: As indicated on drawings and on all walls and ceiling surfaces in rooms with wet locations. *i.e. toilet rooms, kitchens, mechanical rooms, or other areas where water is present or is commonly used.*
1. Type C: Where required for specific fire-resistance-rated assembly indicated.

C. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

D. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

E. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

A. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

4. Level 5: Where indicated on Drawings. (Provide where VWC is to be installed on top of surface)

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other potential causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Porcelain tile.
2. Tile backing panels.
3. Metal edge strips.

B. Related Requirements:
1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for **cementitious backer units**.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory **for each color and finish required**.
3. Metal edge strips in 6-inch (150-mm) lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products **and certified porcelain tile**.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: **Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated.**

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installer employs **Ceramic Tile Education Foundation Certified Installers** or **installers recognized by the U.S. Department of Labor as Journeyman Tile Layers**.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of **each type of** floor tile installation.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

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

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements **unless otherwise indicated**.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

A. Ceramic Tile Type (**CT-1 as indicated on drawings)** : Glazed porcelain tile.

1. Certification: Tile certified by the Porcelain Tile Certification Agency.
2. Face Size: 8 **by 40 inches**.
3. Face Size Variation: Rectified.
4. Thickness: **3/8 inch (9.5 mm)**.
5. Face: **Plain with square or cushion edges / manufacturers standard**.
6. Dynamic Coefficient of Friction: Not less than 0.42.
7. Tile Color, Glaze, and Pattern: **Match Architect's sample and tile manufacturer designated on the drawings. Final Tile is as selected by Architect from manufacturer's full range**.
8. Grout Color: **As selected by Architect from manufacturer's full range**.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **and matching characteristics of adjoining flat tile**. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base Cap: Surface bullnose, module size **same as adjoining flat tile or as selected by Architect from manufacturer's full range**.
    b. External Corners: Surface bullnose, module size **same as adjoining flat tile**.
    c. Internal Corners: Field-butted square corners.

2.3 TILE BACKING PANELS

A. Fiber-Cement Backer Board: ASTM C 1288, in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: **1/2 inch (12.7 mm) or As indicated**.

2.4 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

B. Latex-Portland Cement Mortar (Thinset): ANSI A118.4 and ANSI A118.11.

1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
3. Provide mortar that is specially formulated for large format tile installed on floor or wall.

2.5 GROUT MATERIALS

A. Provide Cementitious grout that exceeds ANSI A118.7 standards.
1. Provide prepackaged and premixed color grout where only water must be added.
2. Provide sanded or un-sanded as recommended by manufacturer for application

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick.

C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; **stainless-steel, ASTM A 666, 300 Series** exposed-edge material.
1. Provide ADA compliant sloped metal transition strips at all transitions between floor finishes.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with **adhesives**, **bonded mortar bed**, or **thinset mortar** comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.

b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with **thinset mortar** with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
   b. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated on drawings. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Ceramic Tile: Mfg. recommended width but not more than 3**/16 inch (6.4 mm)**.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Metal Edge Strips: Install ADA compliant transition **where exposed edge of tile flooring meets carpet, wood, or other flooring in all situations.**

K. Grout Sealer: Apply grout sealer to grout joints **in tile walls & floors** according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. **Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.**

3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F113; thinset mortar.

a. Ceramic Tile Type: As indicated on drawings.
b. Thinset Mortar: Latex- portland cement mortar.
c. Grout: Standard unsanded or sanded cement grout.

B. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.

a. Ceramic Tile Type: as indicated on drawings.
b. Thinset Mortar: Latex-portland cement mortar.
c. Grout: Standard unsanded or sanded cement grout.

END OF SECTION 093013

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Acoustical tiles for ceilings.
2. Concealed suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

C. Samples: For each exposed product and for each color and texture specified, 6-inches-(150-mm-)in size.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Method of attaching hangers to building structure.

    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

B. Qualification Data: For testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other potential causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL TILES, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content.

D. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

E. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL TILES (ACT-1)

A. Classification: Provide tiles complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with painted finish; Form 2, water felted.
2. Pattern: E (lightly textured).
3. And per design basis listed on drawings

B. Color: As selected from manufacturer's full range.

C. LR: Not less than 0.90.

D. NRC: Not less than 0.95.

E. CAC: Not less than 35.

F. AC: Not less than 190.

G. Edge/Joint Detail: Beveled, kerfed and rabbeted, or tongue and grooved, or butt.

H. Thickness: minimum 1 inch.

I. Modular Size: 24 inches by 24 inches.

J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content.

B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **five** times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

    a. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
    b. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchors.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch-(3.5-mm-) diameter wire.

E. **Hanger Rods and Flat Hangers**: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch-(1-mm-)thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch-(8-mm-)diameter bolts.

2.5 METAL SUSPENSION SYSTEM

A. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.

1. Structural Classification: Heavy-duty system.

2. Access: Downward and end pivoted or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

a. Initial Access Opening: In each module, 24 by 24 inches (610 by 610 mm).

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips and complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Staples: 5/16-inch-(8-mm-)long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections

that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged. The face of ceilings tiles should have a consistent surface texture, color, and be unmarked with cuts, gouges or marks.

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

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to **short** axis of space.
3. Install tiles in a basket-weave pattern.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

B. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports. Submit written report to Owner indicating findings of inspections.

3.5 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

1 END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F .

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE (VB-1 as indicated on drawings)

A. Recycled Content of Products: Postconsumer recycled content plus one-half of preconsumer recycled content by weight.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient flooring, sealed concrete or ceramic tile.

C. Thickness: 0.125 inch .

D. Height: 4 inches .

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: **As selected by Architect from full range of industry colors**.

2.2 RUBBER MOLDING ACCESSORY

A. Description: Rubber reducer strip for transition between different flooring materials.

B. Profile and Dimensions: As selected by Architect from full range of manufactures options.

C. Locations: **Provide rubber molding accessories in all locations where Carpet, Resilient flooring or no floor finish transition.**

D. Colors and Patterns: **As selected by Architect from full range of industry colors**.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096516 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes rubber sheet flooring.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
2. Product Data for Credit IEQ 4.3: For adhesives, documentation including printed statement of VOC content.

C. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

D. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than **6-by-9-inch (150-by-230-mm)** sections.

E. Samples for Initial Selection: For each type of resilient sheet flooring indicated.

F. Samples for Verification: In manufacturer's standard size, but not less than **6-by-9-inch (150-by-230-mm)** sections of each different color and pattern of resilient sheet flooring required.

G. Product Schedule: For resilient sheet flooring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Sheet Flooring: Furnish not less than **10 linear feet (3 linear m)** for every **500 linear feet (150 linear m)** or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **70 deg F (21 deg C)** or more than **85 deg F (29 deg C)**, in spaces to receive resilient sheet flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than **55 deg F (13 deg C)** or more than **95 deg F (35 deg C)**.

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 UNBACKED RUBBER SHEET FLOORING (As indicated on drawings)

A. Product Standard: ASTM F 1859.

1. Type: **Type I (homogeneous rubber sheet)**.
2. Thickness: **Approximately 0.14 inches.**
3. Hardness: **Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240**.

B. Wearing Surface: Hammered T**extured**.

1. Molded-Pattern Figure: None.

2. Meet all code requirements for slip resistance per ASTM D2047 Static coefficient of friction.

C. Sheet Width: **As standard with manufacturer but not less then 3.3 feet (1.0 m)**.

D. Colors and Patterns: **As selected by Architect from identified manufacturers as indicated in drawings**.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

1. Adhesives shall have a VOC content of **50** g/L or less.

C. Integral-Flash-Cove-Base Accessories:

1. None: See room finish schedule for base.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

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

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **9** pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:

   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
   1. Additional patching and filling will be required as the existing flooring finishes were demolished leaving an uneven substrate.

D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.

   1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting for manufacturers recommended period.

C. Lay out resilient sheet flooring as follows:

   1. Maintain uniformity of flooring direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
   3. Match edges of flooring for color shading at seams.
   4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, heavy rolling loads, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient sheet flooring with manufacturers suggested material until Substantial Completion, so flooring is not damaged.

END OF SECTION 096516

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes modular, **fusion-bonded or tufted** carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. **Section 096513 "Resilient Base and Accessories"** for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

    a. Review delivery, storage, and handling procedures.
    b. Review ambient conditions and ventilation procedures.
    c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. 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 Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-(300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for **Gold, 52 to 70** points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 8 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the **Commercial II or Master II** certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes as approved by architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, **dimensional stability, excess static discharge, loss of tuft bind strength,** loss of face fiber, and delamination.
3. Warranty Period: Lifetime from date of Substantial Completion.
    a. Bleach Resistant Warranty 15 years
    b. Stain Resistant Warranty: 15 years

PART 2 - PRODUCTS

2.1 CARPET TILE (As indicated on drawings)

A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product as approved by architect.

B. Pile Thickness: 0.130 to 0.146 inches

C. Tufted Yarn Weight: 24 to 34 Ounces Per Square Yard

D. Density: Average density = 6,646 to 8,383: Weight Density = 159,507 to 285,041

E. Primary Backing: 100% Synthetic

F. Secondary Backing: Infinity Modular Reinforced Composite Closed Cell Polymer.

G. Color: **As selected by Architect from identified manufacturers as indicated in drawings**.

H. Pattern: **As selected by Architect from identified manufacturers as indicated in drawings**.

I. Size: 18inch X 36inch

J. Applied Soil-Resistance Treatment: **Manufacturer's standard material**.

K. Antimicrobial Treatment: **Manufacturer's standard material**.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
1. Additional patching and filling will be required as the existing flooring finishes were demolished leaving an uneven substrate.

B. Metal Edge/Transition Strips: Extruded aluminum with **mill** finish of ADA compliant profile and width required per field condition, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
3. Additional patching and filling will be required as the existing flooring finishes were demolished leaving an uneven substrate.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
1. Additional patching and filling will be required as the existing flooring finishes were demolished leaving an uneven substrate.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern:
   1. Pattern as indicated on drawings and approved by architect.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

   1. Remove yarns that protrude from carpet tile surface.
   2. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 09 72 00 - PRESENTATION DRY ERASE WALLCOVERING

PART 1 – GENERAL

1.1 SUMMARY

A. Division Includes:
   1. Magnetic Receptive Dry Erase Wallcovering.
   2. Accessories.
B. Related Divisions:
   1. Division 09 20 00 Plaster and Gypsum Board: Wall substrate.
   2. Division 09 91 23 Interior Painting

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   E84 Test Method for Surface Burning Characteristics of Building Materials.
B. Gypsum Association
   GA-214-M-97 Recommended Levels of Gypsum Board Finish.

1.3 SUBMITTALS

A. Manufacturer's product data and installation instructions for each type of dry erase wallcovering, adhesive, and accessories required.
B. Manufacturer's written product data indicating compliance with specified materials required.
C. Manufacturer's written installation instructions.
D. Manufacturer's written instructions for recommended maintenance of each type of dry erase wall covering required.
E. Samples:
   1. 7 inch (177.8mm) x 9 inch (228.6mm) samples of each dry erase material required.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide each type of dry erase wallcovering required produced by one manufacturer.
B. Installer: Installation by skilled commercial wallcovering contractor with no less than three years of documented experience installing dry erase wallcovering of the types and extent required.

C. Composition:
   1. Magnetic Receptive Dry Erase Wallcovering**:** Provide scrim backed, ferrous powder vinyl bonded with white pigmented vinyl and capped with moderate gloss, dry erase film.
D. Surface Burning Characteristics Classification: Provide materials that meet Class I/A rating when tested in accordance with ASTM E84 for flame spread and smoke developed
E. Field Samples: Prepare field samples for architect's review and establish requirements for seaming and finish trim.
   1. Install sample panel of each type presentation wallcovering specified in area designated by architect.
   2. Maintain corrected and approved samples to serve as a standard of performance for the project.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver presentation wallcoverings to the project site in unbroken and undamaged original factory packaging and clearly labeled with the manufacturer's identification label, quality or grade, and lot number.
B. Store materials in a clean, dry storage area with temperature maintained above 55°F (13°C) with normal humidity.
C. Store material within original packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Do not apply presentation wallcoverings when surface and ambient temperatures are outside the temperature ranges required by the wallcovering manufacturer.
B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 55°F (13°C) unless required otherwise by manufacturer's instructions.
C. Apply adhesive when substrate surface temperature and ambient temperature is above 55°F (13°C) and relative humidity is below forty percent.
D. Maintain constant recommended temperature and humidity for at least 72 hours prior to and throughout the installation period, and for 72 hours after wallcovering installation completion.
E. Provide not less than 80-foot-candles per square foot lighting level measured mid-height at substrate surfaces.

1.7 ` WARRANTY

Submit manufacturer's limited five-year written warranty against manufacturing defects.

1.8 MAINTENANCE

Maintenance instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.1 MANUFACTURER

Basis of Design Wallcoverings:
Walltalkers Wallcoverings manufactured by Koroseal Interior Products, LLC.,

2.2 MATERIALS

A. **Walltalkers mag•rite II:** Magnetic receptive, White, moderate gloss, vinyl surface for dry erase markers.
   1. M248: 47/48 inch (1.19/1.22m) width, scrim backing.

2.3 TRIM & TRAY

A. **None**

2.4 ACCESSORIES

A. **Adhesives:** Heavy-duty clear or clay based premixed vinyl adhesive.
B. **Substrate Primer/Sealer:** White pigmented acrylic base primer/sealer specifically formulated for use with vinyl wallcoverings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 4 finish, per GA-214-M-97: Recommended Levels of Gypsum Board Finish, and permanent lighting should be installed and operational.
B. Test substrate with suitable moisture meter and verify that moisture content does not exceed four percent.
C. Verify substrate surface is clean, dry, smooth, structurally sound, and free from surface defects and imperfections that would show through the finished surface.
D. Evaluate all painted surfaces for the possibility of pigment bleed-through.
E. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.
F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION Wallcovering backing.

A. Acclimate wallcovering in the area of installation a minimum of 24 hours before installation.
B. Read and follow the manufacturer's installation instruction sheet contained in each roll of the dry erase wallcovering.
C. Examine all materials for pattern, color, quantity and quality, as specified for the correct location prior to cutting.
D. Primer: Use a quality pigmented acrylic wallcovering primer.
E. Adhesive: Apply a uniform coat of heavy-duty pre-mixed clay-based or extra strength clear wallcovering adhesive.
F. Install each strip horizontally and in the same sequence as cut from the roll.
G. Install dry erase wallcovering sheets in exact order as they are cut from bolt. Reverse hang alternate strips (except lined products). Do not crease or bend the wallcovering when handling.
H. Install dry erase wallcovering horizontally using a level line.
I. Using a level or straight edge, double cut the seam with a seam-cutting tool (Ex: Double Seam-Cutter or Swedish Knife). Do not score drywall or plasterboard when cutting material.
J. When covering the entire wall, seam the material out of the main writing and viewing areas of the wall.
K. Apply wallcovering to the substrate using a wallcovering smoother, wrapped with a soft cloth, to remove air bubbles. Do not use sharp edged smoothing tools. Smooth material on the wall from the middle to the outside edge.
L. Remove excess adhesive immediately after the wallcovering is applied. Clean entire surface with a warm mild soap solution, and clean soft cloths. Rinse thoroughly with water and let dry before using. Change water often to maintain water clarity.
M. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

3.3 INSTALLATION Self-adhesive backing.

A. Apply Walltalkers adhesive backed dry erase wallcovering only on surfaces impervious to moisture such as chalkboards, marker boards, glass, high-pressure laminates, or similar.
B. Acclimate wallcovering in the area of installation a minimum of twenty-four hours before installation.
C. Examine all materials for color, quantity, and quality as specified for the correct location prior to cutting.
D. Read and follow the instructions in the manufacturer's installation sheet contained in each roll of the dry erase wallcovering.
E. Do not crease or bend the wallcovering when handling.

F. Mix dampening solution by using one half to one capful of mild detergent to 1 gallon (1.81kg) clean water. Damping solution is used in positioning the material and allows for the removal of air bubbles.
G. Use a pump spray bottle to apply the dampening solution to the the surface.
H. Slowly remove release liner and smooth wall covering to the hanging surface using a wallcovering smoother wrapped with a soft cloth from the middle to the outside edge to remove air bubbles.
I. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

3.4 CLEAN-UP

A. Upon completion of installation, remove all exposed adhesive immediately using a soft cloth and a warm, mild soap solution and rinse thoroughly with water and dry with clean towel prior to using.
B. Upon completion of the work, remove surplus materials, rubbish, and debris resulting from the wallcovering installation. Leave areas in neat, clean, and orderly condition.

END OF SECTION 097200

SECTION 098316 – ACOUSTICAL FINISH SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 Section Includes

A. Sprayed cellulose finish system.

1.03 Related Items

A. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.

B. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.

1.04 Submittals

A. Copy of manufacturer's ISO 9001:2008 Certification.

B. Submit 2 copies of test reports indicating compliance with the following:

1. Minimum light reflectivity:
    a. Arctic White: 81+
2. NRC values per ASTM C-423 conducted by a NVLAP certified testing laboratory:

Acoustical finish System on Solid Backing							
Inches	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
1.00"	.05	.40	.94	1.04	.97	.99	.90

3. Flame Spread Index: 5 ASTM E-84/UL 723
4. Smoke Developed: 5 ASTM E-84/UL 723
5. Bond Strength
    a) Acoustical finish System >600 psf ASTM E-736
6. Compression Strength
    a) Acoustical finish System >400 psf ASTM E-761
7. Comply with IBC 803.3/2009 IBC 803.10 stability requirements for interior finishes.

C. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

1.05 Quality Assurance

A. Manufacturer must have a current listing with Underwriters Laboratories (UL) Code Evaluation Report.

B. Manufacturer must be in compliance with the 2009 and 2012 International Building Code.

C. Manufacturer must be ISO 9001:2008 Certified.

D. Applicator: Licensed by manufacturer.

E. Manufacturer must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories. Each bag shall be labeled accordingly.

F. Mock-up: Apply a 100 square foot representative sample to be reviewed by the Architects and/or Owner prior to proceeding.

1.05 Delivery, Storage and Handling

A. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.

B. Store materials dry, off ground and under cover.

C. Protect liquid adhesive from freezing.

PART 2 – PRODUCTS

2.01 Basis of Design Manufacturers

A. International Cellulose Corporation

12315 Robin Boulevard
Houston, Texas 77045
(713) 433-6701 or (800) 444-1252
FAX: (713) 433-2029

B. For approved applicators contact ICC at (800) 444-1252

2.02 Materials

A. SonaSpray “fc” Acoustical Finish (4:1 Adhesive Ratio)
B. Color shall be as selected by architect from manufacturer full range of colors.

PART 3 – EXECUTION

3.01 Examination

A. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.
B. Verify surfaces to receive spray insulation to determine if priming/sealing is required to ensure bonding and/or to prevent discoloration caused by migratory stains.

3.02 Preparation

A. Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.
B. Coordinate installation of the sprayed cellulose fiber with work of other trades.
C. Prime surfaces as required by manufacturer’s instructions or as determined by examination.

3.03 Installation

A. Average thickness to achieve NRC of 0.90 or greater. (minimum thickness of 1”)
B. Install spray applied acoustical finish according to manufacturer’s recommendations.
C. Cure material with continuous natural or mechanical ventilation.
D. Remove and dispose of over spray.

3.04 Protection

A. Protect finished installation under provisions of Division 1.

END OF SECTION 098316 ACOUSTICAL FINISH SYSTEM

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

1. This section cover all interior surfaces indicated to be painted unless otherwise noted.

B. Related Requirements:
1. None

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Sustainable Submittals:

1. Product Data for Credit IEQ 4.2: For paints and coatings, documentation including printed statement of VOC content.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials**, from the same product run,** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 10 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

    a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. .
    b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F .

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F .

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
6. Floor Coatings: 100 g/L.
7. Shellacs, Clear: 730 g/L.
8. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 7/NACE No. 4.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit & cable tray.
f. Plastic conduit.
g. Duct, equipment, pipe insulation, etc…. shall all be painted.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Contractor shall engage a testing agency to take one test per 1,000 sf of project site, but not less than ten samples per project site. Dry Film Thickness Testing: Contractor shall engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

B. Contractor shall touch up and restore painted surfaces damaged by testing.

C. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System **MPI INT 3.1A**:

a. Prime Coat: Primer, alkali resistant, water based**, MPI #3**.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5)**, MPI #54**.

2. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

B. Clay Masonry Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 4.1M:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

C. CMU Substrates:

1. High-Performance Architectural Latex System **MPI INT 4.2D**:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
b. Prime Coat: Primer, alkali resistant, water based**, MPI #3**.
c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
d. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

D. Steel Substrates:

1. Alkyd System

a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76, or Prime Coat: Shop primer specified in Section where substrate is specified.
b. Intermediate Coat: Alkyd, interior, matching topcoat.
c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

2. Alkyd Dry-Fall System MPI INT 5.1D: (this system is for use on metal surfaces on underside of structure or other overhead areas that are indicated to be painted)

a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76, or Prime Coat: Shop primer specified in Section where substrate is specified.
b. Provide (2) Topcoat: Dry fall, alkyd, semi-gloss (MPI Gloss Level 5), MPI #225.

E. Galvanized-Metal Substrates:

1. High-Performance Architectural Latex System MPI INT 5.3M:

a. Prime Coat: Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.

F. Gypsum Board Substrates:

1. High-Performance Architectural Latex System MPI INT 9.2B:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.

END OF SECTION 099123

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Corner guards.
2. End-wall guards.

B. Related Requirements:

1. Section 087100 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

1. Include Samples of accent strips and accessories to verify color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Corner-Guard Covers: Full-size corners guards of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- long units.
2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

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

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.3 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards (CG): Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

1. Material: Stainless-steel sheet, Type 304.

   a. Thickness: Minimum 0.0625 inch .
   b. Finish: Directional satin, No. 4.

2. Wing Size: Nominal 2-1/2 by 2-1/2 inches .
3. Corner Radius: 1/8 inch .
4. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.
5. Length: As indicated in drawings or to a height of 4'-0" above finished floor.

2.4 END-WALL GUARDS

A. Surface-Mounted, Metal, End-Wall Guards (EWG): Fabricated from one-piece, formed or extruded metal that covers entire end of wall; with formed edges.

1. Material: Stainless-steel sheet, Type 304.

   a. Thickness: Minimum 0.0625 inch .
   b. Finish: Directional satin, No. 4.

2. Wing Size: Nominal 2-1/2 by 2-1/2 inches .
   a. Width: Varies, As wide as required for wall conditions
3. Corner Radius: 1/8 inch .
4. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.
5. Length: As indicated in drawings or to a height of 4'-0" above finished floor, unless noted otherwise.

2.5 MATERIALS

A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.6 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

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

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

END OF SECTION 102600

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than **10 inches (250 mm)** square. Mark inside face of material if applicable.

E. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by **manufacturer and witnessed by a qualified testing agency**.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: **Stainless steel**.

a. Loop Length: **Full length of roller shade**.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: **Chain tensioner, jamb mounted**.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

a. Provide for shadebands that weigh more than **10 lb (4.5 kg)** or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: **Right side of inside face of shade unless field condition requires different.**
2. Direction of Shadeband Roll: **Regular, from back of roller unless filed condition requires different.**
3. Shadeband-to-Roller Attachment: **Removable spline fitting integral channel in tube**.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:

1. Shadeband Material: Light Filtering Fabric
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: **Enclosed in sealed pocket of shadeband material.**
b. Color and Finish: **As selected by Architect from manufacturer's full range**.

E. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: **L-shaped**.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than **4 inches (102 mm)**.

2. Installation Accessories Color and Finish: **As selected from manufacturer's full range**.

2.2 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with **NFPA 701**. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: **Roller-shade manufacturer or custom manufacture to meet product requirements.**
2. Type: Manufactuers standard. **Woven PVC-coated fiberglass and PVC-coated polyester or PVC-coated fiberglass with silver backing**.
    1) RS1: Meet requirements.
    2) RS2: Meet requirements and have thin metalized low-E coating to the outward side of the fabric.
3.
4. Weave: **Basketweave**.
5. Thickness: 0.018 inches.
6. Weight: 11.8 **oz./sq. yd.**
7. Roll Width: Min **48 inches (1229 mm) to match window width and provide least number of vertical seams.**
8. Orientation on Shadeband: **Up the bolt or Railroaded, manufactures standard**.
9. Openness Factor: **5** percent.
10. Color: **As selected by Architect from manufacturer's full range**.

2.3 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than **1:4**, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

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

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than **2 inches (51 mm)** to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

1 END OF SECTION 122413

SECTION 123661 – SOLID SURFACE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-surface-material countertops and back-splashes / side-splashes.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 064116 "Plastic-Laminate-Faced Architectural Cabinets"
3. Section 123623.13 ”Plastic-Laminate-Clad Countertops”

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials coordinate with plumbing contractor.

B. Sustainable Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Chain-of-custody certificates indicating that wood products comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches , of construction and in configuration specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Shop that has been in business for a minimum of 15 years, Has a minimum of 10 similar projects of same size, complexity and quaility, and has experience in fabricating casework to AWI standards.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical plastic-laminate and solid surface faced cabinets.

2. Mockup shall be sized to show materials, quality of construction, cabinetry joints, finishes, and overall appearance of final product. Size of mockup and extent to be determined by architect.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.6 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Institute” or "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Straight, slightly eased at top on a built up edge of 1 1/2" thickness, unless noted otherwise for a thicker profile edge.
2. Back-splash: Straight, slightly eased at corner.
3. End-splash / Side-splash: Matching backsplash.

D. Countertops: 1/2-inch thick, solid surface material with front edge built up with same material.

E. Backsplashes: 3/4-inch thick, solid surface material.

F. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. All countertops to be fabricated with 1/2" plywood backing under all horizontal solid surface materials.
2. Use exterior grade plywood at all locations with a sink.

3. At countertops with waterfall edge – Provide Countertop and Cabinet front to meet at a 90 degree corner. The solid surface top is to be flush with vertical face of cabinet/casework and have single visible construction joints or lines. The seam shall be tight and flush between surfaces.
4. At countertops with a thicker than 1 ½" profile edge – Provide Countertop and vertical profile edge to meet at a 90 degree mitered corner. The solid surface top is to be continuous with vertical profile edge without any visible construction joints or lines.

2.2 COUNTERTOP MATERIALS

A. Certified Wood Materials: Fabricate countertops with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.

1. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 10 percent of the total value of the materials.

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

D. Adhesives: Adhesives shall not contain urea formaldehyde.

E. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

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

   a. As listed in room finish schedule or approved equal

2. Type: Provide Standard Type unless Special Purpose Type is required for application, confirm with manufacturer.
3. Colors and Patterns: Match Architect's samples and as indicated with manufactures listed in the room finish schedule.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide “SG series" by Doug Mockett & Company, Inc.
   a. Color to be selected by architect from manufacturers full range.

2. Provide one grommet per workstation, coordinate exact location with owner.

B. Metal Support Brackets: Support brackets for countertops
1. 18" X 24" metal support brackets with 2" X 2" wire management knock outs
2. 11 gauge steel, minimum weight limit of 1,000 lbs per pair of brackets
3. Baked enamel finish with prime coat
   a. Color to be selected by architect from manufacturers full range.
4. One bracket is to be provided for every 4'-0" of countertop per location. Provide 2X miscellaneous rough carpentry wood blocking in wall for each bracket.
5. Manufacturer Design Basis: EH-Surface or Inside Wall Mount Counter Support Bracket.
   a. www.rakks.com

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions (to not visually show any evidence of seam). Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and end-splashes/ side-splashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
3. Seal edges of cutouts in particleboard subtops by saturating with varnish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123661

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE-SUPPRESSION

PART 1 - GENERAL

SCOPE

This section includes information common to two or more technical fire protection specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Related Documents
- Regulatory Requirements
- Reference Standards
- Quality Assurance
- Abbreviations and Symbols
- Definitions
- Coordination
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing and Firestopping
- Off Site Storage
- Submittals
- Operating and Maintenance Instructions
- Record Drawings
- Testing
- Cleaning
- Warranty

PART 2 - PRODUCTS
- Access Panels and Doors
- Pipe Penetrations
- Identification
- Equipment Accessories
- Gauges
- Sealing and Firestopping

PART 3 - EXECUTION
- Demolition
- Openings, Cutting and Patching
- Building Access
- Equipment Access
- Coordination of Work
- Pipe Penetrations
- Identification
- Sleeves

RELATED WORK

Provisions of Division 01 shall govern work under this Section.

This section applies to all Division 21 Sections of Fire Suppression.

REGULATORY REQUIREMENTS

Refer to Division 01 of the Project Manual.

Codes and Standards:
Fire Protection work shall conform to the requirements of Wisconsin Building Code (COMM), NFPA Standards, and local regulations regarding design, materials and installation.

Materials and workmanship shall comply with applicable Codes, local ordinances, industry standards and utility regulations. In case of differences between Codes, and the Contract Documents, the most stringent shall govern.

Non-Compliance:
Should the Contractor perform any work that does not comply with the above requirements, he shall bear all costs necessary to correct the deficiencies.

Permits, Inspections, and Fees:
Request and obtain permits and inspection appointments.

Provide fees and charges for approvals, reviews, or other inspections.

Include copies of the certificates in the Operating and Maintenance Instructions.

Fees and charges assessed by local utilities for water or other services shall be included in the bid.

REFERENCE STANDARDS
Abbreviations of standards organizations referenced in this and other sections are as follows:

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CS	Commercial Standards, Products Standards Sections, Office of Engineering Standards Service, NBS
DSPS	State of Wisconsin Department of Professional Services
EPA	Environmental Protection Agency
FM	Factory Mutual System
FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
IAPMO	International Association of Plumbing & Mechanical Officials
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories Inc.

QUALITY ASSURANCE
Substitution of Materials: Refer to Division 01 of the Project Manual.

All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

ABBREVIATIONS AND SYMBOLS
Key to abbreviations and symbols shall be on the Drawings.

The following are additional abbreviations used in the Specifications:

A/E	Architect/Engineer
GC	General Contractor
PC	Plumbing Contractor
FPC	Fire Protection Contractor
HC	Heating Ventilating and Air Conditioning Contractor
EC	Electrical Contractor

DEFINITIONS

Furnish:

Supply and deliver to Project site ready for unpacking, assembly and installation

Install:

Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting related devices required for product fully functional for intended use after installation.

Provide:

Furnish and install, such that product is fully functional for intended use.

COORDINATION

The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting the Work and arrange accordingly, providing offsets, fittings and accessories as may be required to meet conditions.

CONTINUITY OF EXISTING SERVICES

Refer to Division 01 of the Project Manual.

Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES

Refer to Division 01, of the Project Manual.

SEALING AND FIRESTOPPING

Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

OFF SITE STORAGE

Refer to Division 01 of the Project Manual.

SUBMITTALS

Refer to 01 41 00 of the Project Manual.

Submit shop drawings with space for approval stamps of GC and A/E.

Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following fire protection system data sheet. List piping material types, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves, specialties and equipment with manufacturer and model number. The approved fire protection system data sheet(s) will be made available to the Owners Project Representative for their use on this project.

FIRE PROTECTION SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Hangers & Supports			
Sprinkler Heads			
Valves			
Specialty Valves			
Pipe Specialties			
Fire Protection Specialties			

Shop drawing submittals are to be bound in a three ring binder, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

Submittals shall be sent to the local Fire Chief or Fire Marshal for review prior to the Architect/Engineer. Include copy of approval letter in submission to Architect/Engineer.

Submit plans indicating water supply location and size, piping layout and size, sprinkler locations and type, hanger locations and type, equipment locations and type, valve locations and type, occupancy classes, hydraulic reference points, design areas and discharge densities.

Submit hydraulic calculations for water supply and sprinkler systems. Include summary sheet and detailed work sheets. Describe characteristics of water supply and location of effective point used in calculations. Include graph illustration of water supply, hose demand, and sprinkler demand.

Firestop Systems:
Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

OPERATING AND MAINTENANCE INSTRUCTIONS
Refer to Division 01 of the Project Manual.

Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

- Copies of all approved submittals along with approval letters.
- Manufacturer's wiring diagrams for electrically powered equipment.
- Records of tests performed to certify compliance with system requirements.
- Certificates of inspection by regulatory agencies.
- Parts lists for equipment and specialties.
- Manufacturer’s installation, operation and maintenance recommendations for equipment and specialties.
- Valve schedules
- Warranties
- Additional information as indicated in the technical specification sections

RECORD DRAWINGS
Refer to Division 01 of the Project Manual.

In addition to the data indicated in the General Requirements, maintain fire protection layout record drawings and hydraulic calculations on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings and calculations with the Operating and Maintenance manuals.

TESTING

Equipment, material and labor required for testing, shall be provided by the Contractor.

Contractor shall notify Inspector(s) one day prior to the time when the test is ready to be performed. Contractor shall notify the A/E of date and time for tests.

After the test, indicate in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been tested. The person approving the test shall sign the certification.

Records shall be maintained of testing that has been completed, and shall be made available at the job site to authorities.

Upon completion of the work, records and certifications approving testing requirements shall be submitted.

Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be made with new materials.

CLEANING

Contractor shall keep the premises broom clean and free of all surplus materials, rubbish and debris which is caused by his employees or resulting from his work.

Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, and panels.

Identification plates on equipment shall be free of paint and dirt.

The Contractor shall leave his portion of the work ready for operation.

WARRANTY

Warrant that work functions for one year following acceptance of the system(s).

The Contractor shall keep the system in good working order at no expense, unless defects are clearly the result of improper or abnormal usage.

The Contractor shall submit to the A/E upon request for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 - PRODUCTS

ELECTRICAL REQUIREMENTS

General:

Work shall conform to requirements of Division 26.

Provide wiring diagrams.

ACCESS PANELS AND DOORS

Provide access panels at locations requiring access to mechanical equipment. Locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces concealing valves, ducts or equipment. Provide UL listed, fire rated access panels when penetrating fire rated chase or shaft areas.

Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.

Panels shall be Milcor brand or equivalent.

Panels shall include concealed hinges, cam type locking devices, and have frame/border type necessary for particular wall or ceiling construction they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.

Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.

For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

PIPE PENETRATIONS

Refer to Division 01 requirements as well as the following.

Fire, Smoke And Fire/Smoke Rated Surfaces:

3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.

All fire stopping systems shall be provided by the same manufacturer.

UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions.

Use product that has a rating not less than rating of wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material used includes a sleeve that is an integral part of rated assembly.

Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

Non-Rated Surfaces:

Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.

In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and cored opening or a water-stop type wall sleeve.

At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effectively seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

EQUIPMENT, PIPING AND VALVE IDENTIFICATION

Equipment Labels:

After painting and covering, identify equipment, including pumps, tanks, compressors, and control panels. Locate identification conspicuously.

Identification of equipment shall be by engraved white letters on a black 1/16 inch thick plastic laminate panel, beveled edges, screw mounting, permanently attached to the equipment.

Minimum size:

3/4" x 2 1/2" with 3/8" letters.

Manufacturers:
Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

Pipe Identification:
Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".

Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each branch, adjacent to each access door or panel, at each valve and where exposed piping passes through walls and floors.

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1½"

Manufacturers:
EMED Co., Seton Name Plate Company, or W. H. Brady.

Stencils:
Not less than 1 inch high letters/numbers for marking pipe and equipment.

Valve Tags:
Identify each valve by means of 1½" diameter brass tag fastened to body of valve with copper or brass chain. Identification number shall be stamped thereon with letters a minimum of ½" high. System identification abbreviation shall be stamped with letters a minimum of ¼" high.

The following prefixes shall be used:
SPKR - Sprinklers

Manufacturers:
EMED Co., Seton Name Plate Company, or W. H. Brady.

Valve Charts:
Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart shall be framed behind glass and hung in location selected by Owner. Charts shall show the following:

Valve number	Size
Manufacturer	Type of valve
Type of service	Location

Furnish typewritten chart indicating equipment or areas served by each numbered valve and incorporate in Operating and Maintenance Manuals.

EQUIPMENT ACCESSORIES
Provide equipment accessories, connections, and incidental items.
Install piping connecting to pumps and other equipment without strain at the piping connection. If requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to demonstrate that piping has been properly connected.

GAUGES
Acceptable Manufacturers:
American, Taylor, Trerice, U.S. Gauge, Weiss, or Winters Instruments.

Pressure Gauges:
Industrial quality with phosphor bronze bourdon tube, brass socket, 3½ inch dial face, bronze bushed movement, aluminum case with black finish, white background, black figures readable by person standing on floor.

Ranges shall be as follows:

Fire Protection Water:
0 to 200 psig

PART 3 - EXECUTION

GENERAL

Coordination Of Work:

Review the complete set of Drawings and Specifications and report discrepancies to the A/E. Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning installation and make provisions to avoid interferences. Changes required caused by neglect to coordinate shall be made without expense to the project.

Piping shall not be located above electrical panels.

Anchor Bolts, Sleeves, and Supports:

These items required for the Work shall be furnished by the FPC for proper installation of his work. They shall be installed (except as otherwise specified) by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them. Expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor for the trade with responsibility for directing their proper location.

Adjustments In Locations:

Locations of pipes and equipment, shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

Right Of Way:

New lines which pitch shall have the right-of-way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of conflicts.

Offsets, transitions and changes in direction of electrical raceways, pipes, and ducts shall be made to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings.

ASBESTOS ABATEMENT

Asbestos abatement shall be by the Owner. If asbestos is encountered, the Owner shall be notified. Asbestos materials shall be removed prior to continuing work.

DEMOLITION

Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

All pipe, sprinklers, equipment, wiring, associated conduit and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the Owner for his use at a place and time he so designates. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

OPENINGS, CUTTING AND PATCHING

Refer to Division 01 requirements.

The FPC may perform core drilling for openings in existing walls and floors at the direction of the A/E. Framed openings shall be by the GC.

BUILDING ACCESS

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

EQUIPMENT ACCESS

Install all piping, valves, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on surface, for use in accessible ceilings.

COORDINATION OF WORK

Install systems, equipment and piping in cooperation with other trades. Locations of pipes, equipment, fixtures, etc., shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made as required whether or not indicated on the Drawings.

Provide appropriate sections of work with required wall, roof and floor opening locations and dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of Contractor.

PIPING INSTALLATION

General:

Expansion and contraction of piping shall be provided for by expansion loops, bends, swing joints, or expansion joints to prevent damage to connections, piping, and equipment of the building.

Installation Arrangement:

Install work to permit removal (without damage to other parts) of parts requiring replacement or maintenance. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components and to clear the openings of swinging and overhead doors and of access panels.

Connections Different From Those Shown:

Where equipment requiring different arrangement or connections from those shown is used, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When requested by the A/E, submit drawings showing the proposed installation.

Upon approval of the revisions, make changes in piping, ductwork, supports, insulation, wiring, and panelboards. Provide additional valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including required changes in affected trades. The Contractor shall be responsible for the proper location of rough-in and connections by other trades.

Changes shall be made at no increase in the Contract amount or additional cost to the other trades.

SLEEVES

Provide galvanized sheet metal sleeves for fire rated pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required. Grout holes directly around steel pipe.

In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 3/4 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

PIPE PENETRATIONS

General:

Coordinate location of building surface penetrations with appropriate contractors. Furnish sleeves, inserts, and devices to be built into structure to contractor performing Work. Prepare Shop Drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until Shop Drawings are approved.

Fire Rated Surfaces:

Install products in accordance with the manufacturer's instructions where pipe penetrates a fire rated surface. When pipe is insulated, use product that maintains integrity of insulation and vapor barrier. Where sleeve must be installed in existing floor, grout area around sleeve to restore floor integrity. In wet area floor penetration, top surface of penetration to be 2 inches above adjacent floor with additional height obtained by means of concrete pad poured integral with floor.

Non-Rated Surfaces:

Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when insulation completely covers wall opening and insulation end is trimmed in a neat manner. Occupied spaces for this Paragraph include only those rooms with finished ceilings and penetration occurs below ceiling.

In exterior wall openings below grade, place water-stop type wall sleeve before concrete pour or core drill opening after pour. Assemble rubber links to proper size for pipe and tighten in place in accordance with manufacturer's instructions.

Install galvanized sheet metal sleeve in hollow wall penetrations to provide backing for sealant. Apply sealant to both sides of penetration in a manner that annular space between pipe sleeve and pipe or insulation is completely blocked.

Completely seal (or caulk) around pipe penetrations through non-rated, smoke tight corridor walls in healthcare facilities. Refer to architectural drawings for additional information.

Completely seal pipe penetrations, as specified below, for walls of the following rooms below:

- Non-fire rated mechanical rooms
- Computer rooms
- Conference rooms
- Private offices

ESCUTCHEON PLATES

Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.

PAINTING

Refer to Division 09.

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

Identify interior piping mains not less than once every 25 feet, not less than once in each room, adjacent to each access door or panel, and on both sides of the partition where exposed piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background or approved pipe marking label systems.

Identify valves with signs per NFPA rulings.

Provide hydraulic design information sign of permanently marked weatherproof metal or engraved nameplate material. Secure to main fire risers/valves with brass chain. Information to include location of the design areas, discharge densities, required flow and residual pressure at the base of riser, hose stream demand and sprinkler demand.

END OF SECTION

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SECTION 21 05 29
HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

SCOPE

This section includes specifications for supports of all fire protection equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Description
- Design Criteria
- Submittals

PART 2 - PRODUCTS
- Manufacturers
- Structural Supports
- Pipe Hangers and Supports
- Beam Clamps
- Riser Clamps
- Concrete Inserts
- Anchors
- Equipment Stands

PART 3 - EXECUTION
- Installation
- Hanger and Support Spacing
- Riser Clamps
- Concrete Inserts
- Anchors

RELATED WORK

Provisions of Division 01 shall govern work under this Section.

Section 21 05 00 – Common Work Results for Fire-Suppression
Section 21 10 00 – Water-Based Fire-Suppression Systems

REFERENCE STANDARDS

MSS SP-58
MSS SP-69

NFPA 13	Installation of Sprinkler Systems (Latest prevailing addition).
UL	Underwriters' Laboratories Listed.
FM	Factory Mutual Approved

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 of the Project Manual.

DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

Fasteners depending on soft lead for holding power or requiring explosive powder actuation will not be accepted.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

DESIGN CRITERIA

Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

Materials and application of pipe hangers and supports shall be in accordance with NFPA rulings and be UL/FM listed and approved.

SUBMITTALS

Submit data in accordance with Section 21 05 00 and Division 01 of the Project Manual.

Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service. Provide details on the working drawings submitted for approval with all pertinent information listed.

PART 2 - PRODUCTS

MANUFACTURERS

B-Line, Fee and Mason, Grinnell, Hilti, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology, Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.

STRUCTURAL SUPPORTS

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

PIPE HANGERS AND SUPPORTS

Hangers for Pipe Sizes 1/2" through 4":

Carbon steel, adjustable swivel ring with 3/8" min. UL/FM approved hanger rods. B-Line B3170NF, Grinnell 69 or 70.

Carbon steel, adjustable clevis, standard, with UL/FM approved size hanger rods. B-Line B3100, Grinnell 260.

Hangers for Pipe Sizes 4" Through 8":

Carbon steel adjustable swivel ring with ½" min. UL/FM approved hanger rods. B-Line B3170NF, Grinnell 69 or 70.

Carbon steel, adjustable clevis, standard with UL/FM approved size hanger rods. B-Line B3100, Grinnell 260.

Multiple or Trapeze Hangers:

Manufactured steel channel system with manufacturers slotted interlocking pipe clamps with screw/nut securing and threaded hanger rods or steel channels with welded spacers and threaded hanger rods.

Steel channel, 12-gauge thickness, Dura-Green epoxy coating, B-Line B11. Restrain individual pipes with B-Line B2000 series or Vibraclamp series strut clamps.

Wall Support:

Carbon steel welded bracket with hanger. B-Line 3060 Series, Grinnell 190 Series.
Steel channels with pipe clamps.

Vertical Support:
Carbon steel riser clamp. B-Line B3373, Grinnell 261 for above floor use. Grinnell 40 with bolts and concrete anchors for attachment to underside of concrete floor deck.

Floor Support:
Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

Copper Pipe Supports:
All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

PIPE HANGER RODS
Steel Hanger Rods:
Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts. Steel, electro-plated, threads on both ends, B-Line B3205

Size rods for individual hangers and trapeze support as indicated in the following schedule:

Pipe Size:	Diam. Of Rod:
Up to and Including 4"	3/8" or 9.5mm min.
5",6" and 8"	½" or 12.7mm min.

BEAM CLAMPS
MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

CONCRETE INSERTS
Poured in Place:
MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Grinnell 281.

MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Grinnell 282.

Drilled Fasteners:
Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Powers/Rawl, Redhead.

ANCHORS
Use welding steel shapes, plates, and bars to secure piping to the structure.

EQUIPMENT SUPPORT
Support equipment plumb, rigid, and true to line. Examine Drawings, and manufacturer's data to determine how equipment and piping are to be supported, mounted, or suspended. Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

Equipment Stands:
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

INSTALLATION

Size, apply and install supports and anchors in compliance with manufacturers recommendations.

Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and contraction.

Design supports of strength and rigidity to suit loading, service, and manner which do not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire as hangers.

Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where inserts are not practical, provide channels or angles from which to suspend hangers/supports. Fasten structural steel to concrete with expansion bolts.

Provide expansion anchors in concrete slabs for installation of threaded support rods.

Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers to structural steel.

Coordinate hanger and support installation to properly group piping of all trades.

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.

Perform welding in accordance with standards of the American Welding Society.

HANGER AND SUPPORT SPACING

Support horizontal piping per NFPA 13.

Provide vertical support at each floor level as the pipe passes through the floor. For piping that does not pass through the floor, provide adequate support to stabilize the vertical portion of the piping.

Provide galvanized steel supports for steel piping.

Provide CPVC dipped hangers or provide Unistrut “Uni-Cushion” vinyl strip at galvanized hangers for copper lines.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of these specifications.

Space hangers for pipe as follows:

Pipe Material:	Pipe Size:	Max. Horiz. Spacing:	Max. Vert. Spacing:
Copper	3/4" through 1"	8'-0"	10'-0"
Copper	1-1/4" through 1-1/2"	10'-0"	10'-0"
Copper	2" through 3"	12'-0"	10'-0"
Copper	3-1/2" through 8"	15'-0"	10'-0"
Steel	1" through 1-1/4"	12'-0"	15'-0"
Steel	1-1/2" through 8"	15'-0"	15'-0"

Unsupported length from the last hanger and an end sprinkler shall be as follows:

Pipe Size:	Length:
1" piping	Not greater than 36"
1-1/4" piping	Not greater than 48"
1-1/2" piping	Not greater than 60" or larger

RISER CLAMPS

Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor. Use method of securing the vertical risers to the building structure below in stairwell locations.

ANCHORS

Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

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SECTION 21 10 00
WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

SCOPE

This section contains specifications for an Automatic Fire Sprinkler System for this project. Included are the following topics:

PART 1 – GENERAL
- Scope
- Related Work
- Reference Standards
- Description
- System Description
- Design Standards
- Quality Assurance
- Submittals

PART 2 – PRODUCTS
- Pipe
- Fittings
- Joints
- Valves
- Flow Switches
- Tamper Switches
- Sprinklers
- Miscellaneous Equipment

PART 3 – EXECUTION
- Installation
- General
- Valves
- Gauges
- Switches
- Sprinklers
- Testing

RELATED WORK

Applicable provisions of Division 01 shall govern work under this Section.

Section 21 05 00 – Common Work Results for Fire-Suppression
Section 21 05 29 – Hangers and Supports for Fire-Suppression Piping and Equipment

REFERENCE STANDARDS

Applicable provisions of Division 01 shall govern work under this section.

Local and State Codes and Regulations.

National Fire Codes (NFC) published by NFPA; latest edition of standards listed:
- NFPA 13 - Sprinkler Systems

Local Fire Department requirements.

All items to be UL listed or FM approved for intended usage.

DESCRIPTION

Fire Protection Contractor shall furnish all calculations, design, drawings, material, equipment, labor and related items required to complete the work indicated on drawings and specifications.

The work under this Section includes, but is not limited to the following:

- Provide all components for a complete wet pipe automatic sprinkler system including shutoff valves with supervisory switch, fire department connection, main drain valve, test valve(s), alarms, piping, and all necessary components to make a complete, operational, and approved system.
- Provide complete, approved automatic sprinkler system(s) to give fire suppression coverage to all areas/rooms, including electrical rooms, elevator shafts, and elevator equipment rooms.

This portion of the project is design build. The contractor shall follow the specifications for type of systems, materials and equipment to use.

The contractor will be the Engineer of Record and shall prepare, seal and submit drawings and calculations as required to obtain approval and building permit from State, Insurance Company, and local authority. Submit drawings and calculations to all authorities as required.

These documents, along with local regulations and codes, will be the basis for the Fire Protection design and construction.

The contractor shall calculate, size and select all systems as defined by the documents. This shall include coordination with other trade contractors including wiring of flow switch(es) and supervisory switch(es). All calculations, sizes, and system layouts shall include provisions for future additions.

SYSTEM DESCRIPTION

Connect to the existing sprinkler system as required for this renovation.

DESIGN STANDARDS

Sprinkler system shall be designed and hydraulically calculated by the Contractor to provide densities as indicated below. Hydraulically calculate the system based on Light Hazard Occupancy in general areas.

Design system for the most hydraulically remote area based on the following:

Space Type/ Location:	Occupancy Classification	Density (GPM/Ft^2)	Area ($Ft.^2$)	Hose (GPM)	Max Vel. (Ft./Sec.)	Duration (Min.)
Common Areas	Light Hazard	0.10	1,500	100	20	60
Office Spaces	Light Hazard	0.10	1,500	100	20	60
Mech. Rooms	Ordinary (Group 1)	0.15	1,500	250	20	90
Storage	Ordinary (Group 1)	0.15	1,500	250	20	90

Available water supply data for system design is as follows:

Test Date and Time: November 2nd, 2016, 2:00pm.
Performed by City of Madison, Water Utility

Water Supply Hydrant Location	Outlet Elevation	Flow (GPM)	Static (PSI)	Residual (PSI)
Wilson St. HYDRA- 5150-18	903 ft.	1230	64	60

Water test data is preliminary for bidding purposes. Contractor shall perform a field flow and pressure test on municipal water supply main to verify existing conditions, as well as conditions of any new municipal main installation, in the adjacent street, and obtain any additional test data required for design. Tests to be representative of high water use periods.

Building is served by an existing Fire Pump with 100 PSIG at top of riser.

Contractor shall submit seven (7) copies of hydraulic calculations with shop drawings on standard form specified in NFPA No. 13, Chapter 7, Sections 7-2 through 7-3.5 inclusive and Figures A-7-3.3 and A-7- 3.4.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 21 05 00 and Division 01 of the Project Manual.

Fire protection system components shall be rated for a minimum operating pressure of 175 psig.

To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

SUBMITTALS

Shop Drawings:

Submit shop drawings of all fire sprinkler system components.

Plans:

Submit contractor-prepared plans/drawings.

Submit per NFPA 13; installation plans, working plans, shop drawings, hydraulic calculations, and manufacturer's data on devices, etc., indicating by model and number to be used for review and approval. Contractor shall obtain the necessary insurance underwriters, State and Local Fire Department approvals prior to submitting shop drawings. Include copy of approval letter in submission to Architect/Engineer.

Prepare drawings at minimum scale of 1/8” per foot for plans and 1/4" per foot or larger for details. Show all piping, lighting, equipment, ductwork, sprinklers, hangers, roof construction and occupancy of each area, including ceiling and roof heights.

Installation shall be coordinated with the latest architectural, structural, mechanical, plumbing and electrical drawings.

Contractor shall submit drawings to Engineer which have been reviewed and stamped "approved" by the authority having jurisdiction. No work shall commence until all approvals have been obtained. Allow sufficient time in the construction schedule for the approvals.

As-Built Drawings:
Maintain at the site an up-to-date marked set of as-built drawings which shall be corrected and delivered to the Architect upon completion of the work.

Furnish the Architect one (1) reproducible print of corrected shop drawings, including plans, revised to show "as built" conditions.

PART 2 - PRODUCTS

PIPE
Wet Systems:
Carbon steel pipe, black, thickness per NFPA 13, conforming to ASTM A53, A135, A795.

Sprinkler piping shall be schedule 40 threaded up to and including 2” in size.

Schedule 10 threaded light wall not allowed (2” and under).

FITTINGS
Malleable iron, Class 150, threaded, ANSI B16.3.

Ductile iron, grooved end, 300 lb/in2 working pressure rating, UL listed or FM approved for automatic sprinkler.

Ductile or malleable iron, plain end with EPDM gasket, carbon steel bolts or locking lugs UL listed or FM approved for automatic sprinkler, Grinnell "Sock-it".

Carbon steel, butt-welded, class 150, ASTM A234.

Carbon steel, Class 150, flanged, ASTM A105.

JOINTS
Iron Pipe:
Tapered pipe threads, with Teflon tape, ANSI B2.1.

Mechanical coupling, EPDM gasket, UL listed or FM approved for automatic sprinkler.

Rigid Type:
Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be permitted if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer’s latest recommendations. Victaulic FireLock® EZ Style 009H (2” thru 4”) and Victaulic Style 107H QuickVic™ (2” thru 8”) shall be installation ready stab-on design, for direct ‘stab’ installation onto grooved end pipe without prior field disassembly and no loose parts. 10” and larger sizes shall be Victaulic Style 07 Zero-Flex standard rigid coupling.

Flexible Type:
Use in seismic areas and where required by NFPA 13. Victaulic Style 177 QuickVic™ (2” thru 8”) shall be installation ready stab-on design, for direct ‘stab’ installation onto grooved end pipe without prior field disassembly and no loose parts. 10” and larger sizes shall be Victaulic Style 75 or 77 standard flexible coupling.

VALVES

Manufacturers:

Grinnell, Nibco, TYCO, Victaulic, or Wilkins.

Shutoff Valve:

Butterfly Valve:

Ductile iron body, epoxy coated, EPDM encapsulated ductile iron disc, 300 psi maximum working pressure, indicating type, with tamper switch in actuator, grooved end connections, UL Listed or FM approved, Victaulic Figure 705-W.

Check Valve:

Ductile iron body, rubber-encapsulated disc, 250 psi maximum working pressure, grooved end connections. Victaulic style 717.

Test Drain Valve:

Ball valve type, bronze, combination test and drain, with site glass, Sure-Test by G/J Innovations.

If design flow cannot be reached through the inspector's test drain, then the FPC shall install forward flow by-pass around the fire department connection check valve.

FLOW SWITCHES

UL listed and FM approved vane type waterflow switch with metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system. Equal to Potter Model VSR-F.

TAMPER SWITCHES

For O S & Y valve or post indicator installations, UL listed, FM approved, to monitor position of valve, tamper resistant cover screws, single or double SPDT switch contacts, corrosion resistant, for indoor or outdoor use, NEMA 4 & 6P enclosures. Equal to Potter Model PCVS-1, -2 and OSYSU-1, 2.

SPRINKLERS

Manufacturer:

Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted: Grinnell, Reliable, TYCO, Victaulic and Viking.

General:

Fusible link or glass bulb type, cast brass or bronze construction. Provide heads with nominal 1/2" discharge orifice except where greater than normal density requires large orifice.

Select fusible link or glass bulb temperature rating to not exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (165 degree) fusible link or glass bulb type except at skylights, sealed display windows, unventilated attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, mechanical rooms, storage rooms, or where otherwise indicated.

Provide quantity of spare heads as noted below and 1 wrench for each type of head and each temperature range installed. Provide 6 spare heads per 300 or less installed heads, 12 per 1000 or less and 24 for more than 1000. Provide steel cabinet for storage of heads and wrenches.

Types:

Refer to Sprinkler Schedule on plans for sprinkler head types and finishes in each area. Provide sprinkler guards in areas where sprinklers may be subject to damage (i.e. mechanical rooms).

Finished Areas:
Chrome plated bronze body quick response pendent, concealed, or side-wall sprinklers with glass bulb heat sensor. Semi-recessed and sidewall sprinklers shall have adjustable recessed escutcheon. Concealed sprinklers shall have adjustable cover plates. Cover plates shall match ceiling color. Design Basis: Victaulic Model V27.

Unfinished Areas:
Plain bronze body, upright or pendent, quick response sprinklers, with solder link or glass bulb for wet system. Plain bronze, upright or pendent open sprinkler for dry system. Design Basis: Victaulic Model V27 or V36.

Ratings:
See sprinkler ratings indicated on Sprinkler Schedule on plans. Use higher temperature-rated sprinkler heads in areas near heat sources, elevator equipment rooms, and elevator shafts.

MISCELLANEOUS EQUIPMENT
Provide other equipment and accessories, not listed, but required for a complete sprinkler system in accordance with NFPA and FM requirements.

PART 3 - EXECUTION

INSTALLATION
Install sprinkler system in accordance with requirements of NFPA 13 and local regulations of the fire marshal.

Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

GENERAL
Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of window, doorway, stairway or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of fire protection piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, ceiling grid layout, light fixtures and grilles before installing piping. All exposed overhead piping shall be installed above the bottom chord of roof joists.

Maintain piping in clean condition internally during construction.

Provide clearance for access to valves and piping specialties.

Install piping so that system can be drained. Where possible, slope to main drain valve. Piping may be installed level (WET SYSTEMS ONLY). Where piping cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or valve/nipple/cap for drainage over 5 gallons.

Do not install piping within exterior walls.

Do not route piping above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

VALVES

Properly align piping before installation of valves. Do not support weight of piping system on valve ends. Mount valves in locations which allow access for operation, servicing and replacement. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted. All system shut-off valves shall have a supervisory switch.

GAUGES

Provide a valved pressure gauge in main sprinkler risers.

SWITCHES

Provide valved test connection for flow switch adjacent to flow switch. Test flow switch to verify proper operation.

SPRINKLERS

Locate sprinklers maintaining clearances from obstructions, ceilings and walls. Install sprinklers level in locations not subject to spray pattern interference.

Sprinklers shall be centered in all ceiling panels and tiles. A 1” tolerance for sprinkler placement is acceptable.

TESTING

Refer to Section 21 05 00 – Common Work Results for Fire Suppression.

Hydro-statically pressure test the fire sprinkler system piping as required in NFPA 13. Keep records of all testing for submission in Operation and Maintenance Manuals.

END OF SECTION

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SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

SCOPE

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:

PART 1 – GENERAL
- Scope
- Related Work
- Regulatory Requirements
- Reference Standards
- Quality Assurance
- Abbreviations and Symbols
- Definitions
- Coordination
- Electronic Drawings
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sealing and Firestopping
- Equipment Furnished by Others
- Off Site Storage
- Submittals
- Specified Materials and Equipment
- Equipment Installation
- Operating and Maintenance Manuals
- Record Drawings
- Testing
- Cleaning
- Warranty

PART 2 - PRODUCTS
- Electrical Requirements
- Access Panels and Doors
- Pipe Penetrations
- Equipment, Piping, and Valve Identification
- Equipment Accessories

PART 3 - EXECUTION
- General
- Asbestos Abatement
- Demolition
- Openings, Cutting and Patching
- Building Access
- Equipment Access
- Coordination of Work
- Piping Installation
- Sleeves
- Pipe Penetrations
- Escutcheon Plates
- Painting
- Identification

RELATED WORK

01 41 00 Regulatory Requirements govern work under this Section.

This section applies to all Division 22 sections of plumbing.

REGULATORY REQUIREMENTS

Codes and Standards:

All plumbing work shall conform to the requirements of Wisconsin Administrative Code SPS 382 and SPS 384, Wisconsin Uniform Plumbing Code.

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.

Non-Compliance:

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.

Permits, Inspections and Fees:

All required, permits, and inspections shall be requested and obtained by the Contractor.

All fees and charges for approvals, reviews, or other inspections shall be paid by the Contractor.

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).

REFERENCE STANDARDS

Standards cited in the Specifications shall be the most recent editions.

Abbreviations of standards organizations referenced in this and other sections are as follows:

ABMA American Boiler Manufacturers Association
ANSI American National Standards Institute
ASME American Society of Mechanical Engineers
ASPE American Society of Plumbing Engineers
ASSE American Society of Sanitary Engineering
ASTM American Society for Testing and Materials
AWWA American Water Works Association
AWS American Welding Society
CISPI Cast Iron Soil Pipe Institute
CGA Compressed Gas Association
CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
EPA Environmental Protection Agency
FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
IAPMO International Association of Plumbing & Mechanical Officials
IEEE Institute of Electrical and Electronics Engineers
ISA Instrument Society of America
MCA Mechanical Contractors Association
MICA Midwest Insulation Contractors Association
MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS National Bureau of Standards
NEC National Electric Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NSF National Sanitation Foundation
PDI Plumbing and Drainage Institute
UL Underwriters Laboratories Inc.

Standards referenced in this section:

ACI 614	Recommended Practice for Measuring, Mixing and Placing of Concrete
ASTM D1557	Standard Test Method for Moisture-Density Relations of Soils
ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to 01 25 13 Product Substitution Procedures.

All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

ABBREVIATIONS AND SYMBOLS

Key to abbreviations and symbols shall be on the Drawings.

The following are additional abbreviations used in the Specifications:

A/E	Architect/Engineer
GC	General Contractor
PC	Plumbing Contractor
FPC	Fire Protection Contractor
HC	Heating Ventilating and Air Conditioning Contractor
EC	Electrical Contractor

DEFINITIONS

Furnish:

Supply and deliver to Project site ready for unpacking, assembly and installation.

Install:

Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting related devices required for product fully functional for intended use after installation.

Provide:

Furnish and install, such that product is fully functional for intended use.

COORDINATION

The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting the Work and arrange accordingly, providing offsets, fittings and accessories as may be required to meet conditions.

ELECTRONIC DRAWINGS

Drawings in electronic format will be made available to successful Plumbing contractor at a non-refundable cost specified under 01 41 00. Drawings provided may or may not be updated to reflect Addenda items. Use of Drawings is limited to this Project and may not be forwarded to any other party for any purpose. Use of files will be at Contractor's sole risk and without liability or legal exposure to JDR Engineering, Inc or its employees. Architectural drawings or any other drawings not produced by JDR Engineering will not be provided.

CONTINUITY OF EXISTING SERVICES

Refer to 01 41 00 and 01 76 00 of the Project Manual.

Do not interrupt or change existing services without prior approval from Owner, Architect, Engineer or Construction Manager. When interruption is required, coordinate down-time with Owner to reduce disruption to activities. Scope of Work is indicated on Contract Documents or described herein. Unless specifically stated, any work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES

Refer to 01 76 00 Protecting Installed Construction in the Project Manual.

Furnish one can of touch-up paint for each different color factory finish to be finished surface of product. Deliver touch-up paint with other "loose and detachable parts" as covered in General Requirements.

SEALING AND FIRESTOPPING

Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

EQUIPMENT FURNISHED BY OTHERS

Drawings indicate equipment to be furnished or installed by Others. When providing utility connections, coordinate exact requirements, including quantity, location, elevation size, material, flow and pressure.

OFF SITE STORAGE

Refer to 01 41 00 of the Project Manual.

SUBMITTALS

Refer to 01 41 00 of the Project Manual.

Submit shop drawings with space for approval stamps of GC and A/E.

Submit the following plumbing system data sheet for approval by the GC and A/E. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer and model number.

PLUMBING SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Butterfly			
Balancing			
Check			
Other			
Pipe Specialties:			
Thermometers			
Press Gauges			
Strainers			
Building Penetrations			
Hangers & Supports			
Insulation			
Plbg. Specialties:			
Floor Drains			
Cleanouts			

Water Hammer Arrestors
Plbg. Fixtures:
Sink
Faucet
Stop/Supplies
Waste/Trap

Submit manufacturer's color charts where finish color is specified to be selected by Architect/Engineer.

Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

Firestop Systems:
Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

SPECIFIED MATERIALS AND EQUIPMENT
Design is based on equipment specified by manufacturer and model number as specified on Drawing Schedules. Where certain items are specified by manufacturer or trade name, Contractor's bid shall be based on use of named item. Where one (1) make is described and other makes are listed, comparable models of other named equipment may also be used, provided they meet requirements of Specifications.

When equipment or accessories used differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those on Drawing schedules, Contractor shall be responsible for costs involved in integrating equipment or accessories into system. Contractor shall be responsible for obtaining original design performance from system into which items are placed, regardless of whether manufacturer/model is specified equivalent or substitute.

If Contractor wishes to use items other than those named in Specifications in base bid, request for approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids. Include complete technical and descriptive data with request. If approved, an Addendum will be issued notifying bidders of approval. Request for approval will be considered only if requested by prime bidding Contractor.

EQUIPMENT INSTALLATION
Drawings show general arrangement and location of equipment and appurtenances. It is Contractor’s responsibility to install equipment in a location and manner that allows for proper service and maintenance access to equipment. Work shall generally conform to requirements shown on Drawings. However, location of equipment may require field adjustments to obtain required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment. Because of scale of Drawings, it is not possible to indicate exact routing of piping, and offsets, fittings and accessories required to provide proper service access to equipment. Contractor shall route and install ductwork and piping to provide required service access to equipment.

If, during construction phase of Project, contractor feels inadequate space exists, or equipment locations must be substantially modified to provide proper service and maintenance access, prior to installing equipment, contractor shall notify engineer in writing, outlining general concerns and proposed modifications. Equipment installed without providing manufacturer’s required maintenance and service clearance shall be considered defective. Contractor shall remove and relocate piping, ductwork and equipment, to provide required service clearances at contractor’s expense.

OPERATING AND MAINTENANCE INSTRUCTIONS
Refer to 01 77 00 Closeout procedures in the Project Manual.

Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

- Copies of all approved shop drawings.
- Manufacturer's wiring diagrams for electrically powered equipment
- Records of tests performed to certify compliance with system requirements
- Certificates of inspection by regulatory agencies
- Parts lists for fixtures, equipment, valves and specialties.
- Manufacturer's installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
- Valve schedules
- Lubrication instructions, including list/frequency of lubrication
- Warranties
- Additional information as indicated in the technical specification sections

RECORD DRAWINGS

Refer to 01 77 00 Closeout procedures in the Project Manual.

Maintain Record Drawings on daily basis to be turned over at completion of Project.

TESTING

Provide materials, labor, and equipment required for testing.

Notify Inspector(s) one day prior to the time when the test is ready to be performed.

After testing, submit in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been tested. The person approving the test shall sign the submittal.

Records shall be maintained of testing that has been completed, and shall be made available at the job site.

Upon completion of the work, records and certifications approving testing requirements shall be submitted.

Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be made with new materials.

CLEANING

Keep the premises broom clean and free of surplus materials, rubbish and debris.

After fixtures and equipment have been installed, remove stickers, rust stains, labels, and temporary covers.

Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, fixtures, and panels.

Identification plates on equipment shall be free of paint and dirt.

Leave the work in a condition ready for operation.

WARRANTY

Warrant that work shall function for one year immediately following acceptance of the system(s).

Keep the system in good working order at no expense, unless defects are clearly the result of improper or abnormal usage.

Submit for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 – PRODUCTS

ELECTRICAL REQUIREMENTS

General:

Work shall conform to requirements of Division 26.

Power wiring shall be provided by the EC. Control wiring shall be provided by the PC. Plumbing Contractor shall provide wiring diagrams for use by the Electrical Contractor.

ACCESS PANELS AND DOORS

Provide access panels at locations requiring access to mechanical equipment. Locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces concealing valves, ducts or equipment. Provide UL listed, fire rated access panels when penetrating fire rated chase or shaft areas.

Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.

Panels shall be Milcor brand or equivalent.

Panels shall include concealed hinges, cam type locking devices, and have frame/border type necessary for particular wall or ceiling construction they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.

Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.

For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

PIPE PENETRATIONS

Refer to 01 73 29 requirements as well as the following.

Fire, Smoke And Fire/Smoke Rated Surfaces:

3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.

All fire stopping systems shall be provided by the same manufacturer.

UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions.

Use product that has a rating not less than rating of wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material used includes a sleeve that is an integral part of rated assembly.

Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

Non-Rated Surfaces:

Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.

In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and cored opening or a water-stop type wall sleeve.

At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effect seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

EQUIPMENT, PIPING AND VALVE IDENTIFICATION

Equipment Labels:

After painting and covering, identify equipment, including pumps, tanks, compressors, and control panels. Locate identification conspicuously.

Identification of equipment shall be by engraved white letters on a black 1/16 inch thick plastic laminate panel, beveled edges, screw mounting, permanently attached to the equipment.

Minimum size:
3/4" x 2 1/2" with 3/8" letters.

Manufacturers:
Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

Pipe Identification:

Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".

Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each branch, adjacent to each access door or panel, at each valve and where exposed piping passes through walls and floors.

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1½"
8" to 10"	2½"

Manufacturers:
EMED Co., Seton Name Plate Company, or W. H. Brady.

Stencils:
Not less than 1 inch high letters/numbers for marking pipe and equipment.

Valve Tags:

Identify each valve by means of 1½" diameter brass tag fastened to body of valve with copper or brass chain. Identification number shall be stamped thereon with letters a minimum of ½" high. System identification abbreviation shall be stamped with letters a minimum of ¼" high.

The following prefixes shall be used:
PLBG - Plumbing

Manufacturers:
EMED Co., Seton Name Plate Company, or W. H. Brady.

Valve Charts:
Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart shall be framed behind glass and hung in location selected by Owner. Charts shall show the following:

Valve number	Size
Manufacturer	Type of valve
Type of service	Location

Furnish a typewritten chart indicating equipment or areas served by each numbered valve and incorporate in Operating and Maintenance Manuals.

EQUIPMENT ACCESSORIES
Provide equipment accessories, connections, and incidental items.
Install piping connecting to pumps and other equipment without strain at the piping connection. If requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to demonstrate that piping has been properly connected.

PART 3 – EXECUTION

GENERAL
Coordination of Work:
Review the complete set of Drawings and Specifications and report discrepancies to the A/E. Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning installation and make provisions to avoid interferences. Changes required caused by neglect to coordinate shall be made without expense to the project.

Piping shall not be located above electrical panels.

Anchor Bolts, Sleeves, and Supports:
These items required for the Work shall be furnished by the FPC for proper installation of his work. They shall be installed (except as otherwise specified) by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them. Expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor for the trade with responsibility for directing their proper location.

Adjustments In Locations:
Locations of pipes and equipment, shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

Right Of Way:
New lines which pitch shall have the right-of-way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of conflicts.

Offsets, transitions and changes in direction of electrical raceways, pipes, and ducts shall be made to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings.

ASBESTOS ABATEMENT
Asbestos abatement shall be by the Owner. If asbestos is encountered, the Owner shall be notified. Asbestos materials shall be removed prior to continuing work.

DEMOLITION
Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

All pipe, fixtures, equipment, wiring, associated conduit and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the Owner for his use at a place and time he so designates. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

OPENINGS, CUTTING AND PATCHING

Refer to 01 73 29 Cutting and Patching in the Project Manual.

Provisions for openings including chases, holes and clearances through walls, floors, and roof, ceilings and partitions shall be made in advance of construction of each part of the building. Openings shall be provided by the GC for the respective materials in which openings occur, during the construction of the building with the exception of pipe sleeves. The PC shall furnish to the GC opening dimensions and locations.

If the PC neglects to inform the GC of his opening requirements before that portion of the building construction is complete, the PC shall cut the openings and provide framing and lintels. In the event holes must be cut through reinforced concrete, avoid spalling and unnecessary damage or weakening of structural members. No chopping or breaking out is permitted. Before cutting or drilling, obtain permission from the A/E. Patch adjacent materials and repair damage resulting from the cutting.

The PC may perform core drilling for openings in existing walls and floors at the direction of the A/E. Framed openings shall be by the GC.

Patch interior trench excavation to match existing slab-on-grade with concrete: 3500 PSI at 28 days, 3" slump, 3/4" maximum aggregate size, 5.5 bags of cement per cubic yard.

BUILDING ACCESS

Arrange for necessary openings in building to allow for admittance of all apparatus. When building access was not previously arranged and must be provided by Contractor, restore opening to original condition after the apparatus has been brought into building. Coordinate with Architect/Engineer.

EQUIPMENT ACCESS

Install piping, conduit, fixtures, and accessories to permit access to equipment for maintenance. Coordinate exact location of wall and ceiling access panels and doors with General Contractor, making sure access is available for equipment and specialties. Where access is required in plaster walls or ceilings, furnish and install access doors required. Coordinate for installation of access doors utilizing General Contractor and other appropriate on-site subcontractor for access door installation.

Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on surface, for use in accessible ceilings.

COORDINATION OF WORK

Install systems, equipment and piping in cooperation with other trades. Locations of pipes, equipment, fixtures, etc., shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made as required to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings. Furnish and install all traps, air vents, sanitary vents, etc., as required to effect the offsets, transitions and changes in direction.

New lines which pitch shall have the right-of-way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of any conflicts.

Provide appropriate sections of work with required wall, roof and floor opening locations and dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of Contractor.

PIPING INSTALLATION

General:

Expansion and contraction of piping shall be provided for by expansion loops, bends, swing joints, or expansion joints to prevent damage to connections, piping, equipment of the building.

Unions or flanges shall be installed on all by-passes, ahead of all traps, adjacent to screw connection valves, and at all connections to equipment, whether or not shown on drawings.

Installation Arrangement:

Install all Work to permit removal (without damage to other parts) of all parts requiring periodic replacement or maintenance. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

Connections Different From Those Shown:

Where equipment requiring different arrangement or connections from those shown is used, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When requested by the A/E, submit drawings showing the proposed installation.

If the proposed installation is approved, make all incidental changes in piping, ductwork, supports, insulation, wiring, panelboards, etc. Provide any additional motors, controllers, valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of rough-in and connections by other trades.

All changes shall be made at no increase in the Contract amount or additional cost to the other trades.

LUBRICATION AND MAINTENANCE

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

SLEEVES

Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required.

Pipe sleeves are not required in existing poured concrete walls where penetrations are core drilled.

Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 1 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

For floor penetrations through existing floors in mechanical and wet locations listed below, core drill opening and provide 1-1/2" x 1-1/2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from entering the penetration. Provide urethane caulk between angles and floor and fasten angles to floor a minimum of 8" on center. Seal corners water tight with urethane caulk. Or, core drill sleeve openings large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement.

For pipe penetrations through existing floors in food service areas, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement. Size sleeve to allow insulated pipe to pass through sleeve and paint the sleeve.

Pipe sleeves are not required in cored floor pipe penetrations through existing floors that are not located in mechanical rooms, food service areas or wet locations listed above.

PIPE PENETRATIONS

General:

Coordinate location of building surface penetrations with appropriate contractors. Furnish sleeves, inserts, and devices to be built into structure to contractor performing Work. Prepare Shop Drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until Shop Drawings are approved.

Fire Rated Surfaces:

Install products in accordance with the manufacturer's instructions where pipe penetrates a fire rated surface. When pipe is insulated, use product that maintains integrity of insulation and vapor barrier. Where sleeve must be installed in existing floor, grout area around sleeve to restore floor integrity. In wet area floor penetration, top surface of penetration to be 2 inches above adjacent floor with additional height obtained by means of concrete pad poured integral with floor.

Non-Rated Surfaces:

Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when insulation completely covers wall opening and insulation end is trimmed in a neat manner. Occupied spaces for this Paragraph include only those rooms with finished ceilings and penetration occurs below ceiling.

In exterior wall openings below grade, place water-stop type wall sleeve before concrete pour or core drill opening after pour. Assemble rubber links to proper size for pipe and tighten in place in accordance with manufacturer's instructions.

Install galvanized sheet metal sleeve in hollow wall penetrations to provide backing for sealant. Apply sealant to both sides of penetration in a manner that annular space between pipe sleeve and pipe or insulation is completely blocked.

Completely seal (or caulk) around pipe penetrations through non-rated, smoke tight corridor walls in healthcare facilities. Refer to architectural drawings for additional information.

Completely seal pipe penetrations, as specified below, for walls of the following rooms below:

- Non-fire rated mechanical rooms
- Computer rooms
- Conference rooms
- Private offices

ESCUTCHEON PLATES

Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.

PAINTING

Refer to Division 09.

All exposed steel support structures (all metal surfaces located both inside and outside the building) shall be painted after installation with one coat of a compatible metal primer coat and two coats of a finish coat of paint for the application. Color shall be gray unless otherwise specified.

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

END OF SECTION

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

PART 1 - GENERAL

SCOPE

This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Design Criteria
- Submittals

PART 2 - PRODUCTS
- Manufacturers
- Pipe Hangers and Supports
- Pipe Hanger Rods
- Beam Clamps
- Riser Clamps
- Concrete Inserts
- Anchors
- Equipment Support

PART 3 - EXECUTION
- Installation
- Structural Supports
- Hanger and Support Spacing
- Riser Clamps
- Concrete Inserts
- Anchors

RELATED WORK

01 41 00 Regulated Requirements shall govern work under this section.

Section 22 05 00 – Common Work Results for Plumbing
Section 22 07 00 – Plumbing Insulation
Section 22 11 00 – Facility Water Distribution
Section 22 13 00 – Facility Sanitary Sewerage
Section 22 14 00 – Facility Storm Drainage
Section 22 40 00 – Plumbing Fixtures

REFERENCE STANDARDS

MSS SP-58
MSS SP-69

QUALITY ASSURANCE

Refer to 01 41 00 Regulated Requirements in the Project Manual.

DESIGN CRITERIA

Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

General:

Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and contraction.

Design supports of strength and rigidity to suit loading, service, and manner which do not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire as hangers.

Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where inserts are not practical, provide channels or angles from which to suspend hangers/supports. Fasten structural steel to concrete with expansion bolts.

Provide expansion anchors in concrete slabs for installation of threaded support rods.

Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers to structural steel.

On piping insulated with vapor barrier covering, use protection shield to cover bottom one-half of insulated pipe. Shield to be a minimum of 12" long and of 16 gauge galvanized steel.

> Exception:
> For insulated drain pipe, the pipe may rest on the hanger and the insulation to wrap around the hanger and pipe.

Submit anchor drawings for approval upon request.

Hangers, supports, and support methods other than those specified shall not be used without obtaining approval on method of support by the contractor prior to installing piping systems. Submit support method arrangement, pipe weight and spacing scheme for approval.

Hanger and Support Spacing:

Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

Use hangers with 1-1/2 inch minimum vertical adjustment.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of these specifications.

Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Cast Iron	2" and larger	5'-0"	15'-0"
Copper	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"
Copper	3"	10'-0"	10'-0"
Copper	4" and larger	12'-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"
Plastic	1" or less	32"	4'-0"

SUBMITTALS

Submit data in accordance with Section 22 05 00 and 01 25 13 of the Project Manual.

Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

Submit anchor drawings to the A/E for approval upon request.

PART 2 - PRODUCTS

MANUFACTURERS

B-Line, Fee and Mason, Grinnell, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology, Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.

PIPE HANGERS AND SUPPORTS

Overhead Supports:

Adjustable clevis hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3100.

Adjustable J hook hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line figure B3690.

Adjustable band hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3172.

Multiple or Trapeze Hangers:

Where several pipes are running parallel and pitching in the same direction, strut style support may be used. Steel channel, 12-gauge thickness, Dura-Green epoxy coating or electro-plated, B-Line B11. Restrain individual pipes with B-Line B2000 series or Vibraclamp series strut clamps.

Wall Support:

Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194 Series.

Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Grinnell type PS 200 H with PS 1200 clamps.

When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

Vertical Support:

Riser clamp, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3373.

Riser clamp, flexible sleeve with stainless steel band, Proset PS #33.

Floor Support:
Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

Copper Pipe Supports:
All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

PIPE HANGER RODS
Steel Hanger Rods:
Steel, electro-plated, threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts. B-Line B3205.

Size rods for individual hangers and trapeze support as indicated in the following schedule:

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

BEAM CLAMPS
MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

CONCRETE INSERTS
Poured in Place:
MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Grinnell 281.

MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Grinnell 282.

Drilled Fasteners:
Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating, minimum tension load of 3200 pounds. Use drill bit of same manufacturer as anchor.

Manufactured By:
Hilti, Powers/Rawl, Redhead.

ANCHORS
Use welding steel shapes, plates, and bars to secure piping to the structure.

EQUIPMENT SUPPORT
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.

Equipment Stands:
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

INSTALLATION
Size, apply and install supports and anchors in compliance with manufacturers recommendations.

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.

Coordinate hanger and support installation to properly group piping of all trades.

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.

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.

Perform welding in accordance with standards of the American Welding Society.

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

RISER CLAMPS
Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

CONCRETE INSERTS
Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

ANCHORS
Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

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SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

SCOPE

This Section includes insulation specifications for plumbing systems. Included are the following requirements:

PART 1 – GENERAL
- Scope
- Related Work
- Description
- Quality Assurance
- Definitions
- Submittals

PART 2 – PRODUCTS
- Acceptable Manufacturers
- Insulation and Jackets

PART 3 - EXECUTION
- General
- Installation
- Pipe Insulation Schedule

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

Section 22 05 00 - Common Work Results for Plumbing
Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage
Section 22 14 00 - Facility Storm Drainage

DESCRIPTION

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:

- Pipe insulation

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.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Label insulating products delivered to construction site with the manufacturer's name and description of materials.

DEFINITIONS

Concealed:

Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. Other areas, including walk-through tunnels, shall be considered as exposed.

Exposed to weather:

Located outdoors, either on grade, on a wall, or on a roof, in location where sun, wind, rain, snow and other elements will come in contact with it.

Unconditioned spaces:
Unheated or non-cooled attics, utility tunnels and crawl spaces were ambient temperatures may rise above 90 degrees F, or drop below 50 Degrees F. Ducts in these instances are considered to be located outside of building thermal envelope.

SUBMITTALS
Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual

Include manufacturer's data for the following:

- Pipe insulation

Submittal shall include the following information:

Manufacturer's technical data sheets for each product with the following information:

- Density
- Thermal characteristics
- Temperature limitations
- Jacket type
- Materials of composition
- Material safety data sheets

Schedule of all insulating materials to be used including:

- Application / intended use of each insulation type
- Insulation type and thickness
- Jacket type
- Fastening methods and adhesive type

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
Armstrong, Halstead, Johns-Manville, Knauf, or Owens-Corning.

INSULATION AND JACKETS
Glass Fiber:
Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible, "K" Value: 0.23 at 75□F, maximum service temperature: 850□F, with vapor Retarder Jacket: AP-T Plus White Kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed.

PVC Fitting Covers and Jackets:
White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).

PART 3 - EXECUTION

GENERAL
Application of insulation to piping equipment shall be done in accordance with the manufacturer's installation recommendations. Where thickness of insulation is not specified, use thickness recommended by manufacturer or required by applicable Codes.

Insulation shall be applied in as warm an environment as possible, and in no instance below 25□ F.

No pipe shall be covered until after it has been installed, inspected, tested and approved.

INSTALLATION

All pipe insulation shall be installed with joints butted firmly together. All valves and fittings shall be insulated with mitered sections of insulation equal in density and thickness to the adjoining insulation, or with insulating cement equal in thickness to the adjoining insulation, or with "Zeston" type, premolded PVC fittings installed in accordance with the manufacturer's instructions. Fittings are to be finished with 8 oz. glass mesh and mastic (use breather mastic on systems operating above 50°F except where Zeston PVC covers are used). Jackets on pipe insulation may be stapled using outward clinch staples spaced 3" apart at least ¼" in from the lap edge on systems operating at 60°F and above; below 50°F the laps are to be vapor sealed using self-sealing lap, lap-seal tape gun or adhesive such as Armstrong 520. All insulation ends are to be tapered and sealed regardless of service.

On all piping insulated with vapor barrier covering, use protection shield to over bottom one-half of insulated pipe. Shield to be minimum of 12" long and 16 gauge galvanized steel. Provide half-round, 12" long, hanger block at the bottom half of the pipe in place of the fiberglass pipe insulation. The hanger blocks shall be molded cork or calcium silicate pipe insulation of the same thickness as the adjoining fiberglass pipe insulation. The vapor barrier jacket shall be continuous through the hanger location.

Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers shall be sized large enough to be installed over the outer surfaces of the insulation.

Exception:
For insulated drain pipe, the pipe may rest directly on the hanger and the insulation to wrap around the hanger and pipe.

Omit insulation for:

- Unions and flanges.
- Vents to atmosphere, discharges from safety and relief valves and drain pipes.

Provide finished edges at all access doors and end.

PIPE INSULATION SCHEDULE

Provide insulation on new and remodeled piping.

Minimum Insulation Thickness:

	PIPE SIZE			
SYSTEMS	**1" or less**	**1-1/4" to 2"**	**2-1/2" to 4"**	**5" and up**
Storm Drain*	---	---	1"	1"
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"	---

* Provide pipe insulation on above ground horizontal storm and clearwater drain piping, underside of roof drain, and initial 5 feet of vertical conductors.

END OF SECTION

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SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 – GENERAL
- Scope
- Related Work
- Description
- Quality Assurance
- Submittals

PART 2 – PRODUCTS
- Water Distribution Pipe and Fittings
- Valves
- Unions and Flanges
- Dielectric Couplings
- Water Hammer Suppressors

PART 3 – EXECUTION
- Trenching, Backfilling and Compacting
- Water Piping System
- Testing

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

22 05 00 – Common Work Results for Plumbing
22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

DESCRIPTION

Provide a domestic water distribution system including hot and cold water supply piping, hot water return piping, tempered water piping, valves, fittings, hardware, and specialties. Connect to plumbing fixtures, specialties, and equipment.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

SUBMITTALS

Submit valve product data sheets in accordance with Section 22 05 00 and Division 01 of the Project Manual.

Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, and identification as referenced in this section and/or on the drawings.

PART 2 - PRODUCTS

WATER DISTRIBUTION PIPE AND FITTINGS

Above Ground:

Copper tube, Type L, hard temper, ASTM B88; with wrought copper fittings, ANSI B16.22. Join using lead free flux, ASTM B813, and solder, ASTM B32.

Wrought copper, ANSI B16.22 or cast bronze, ANSI B16.18 fittings, copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted), joined with mechanical couplings, synthetic rubber gasket seal, Victaulic style 607 QuickVic™ Installation Ready stab-on design, for direct 'stab' installation onto roll grooved copper tube without prior field disassembly and no loose parts.

VALVES

Manufacturer:

Valves throughout the project shall be by one manufacturer, unless otherwise specified.

Standard valves are based on Nibco models. Equivalent style valves as manufactured by Apollo, Crane, DeZurik, Gustin-Bacon, Grinnell, Hammond, Jenkins, Lunkenheimer, Milwaukee Valve, Stockham, Victaulic, or Watts are acceptable. Valves shall be of standard dimensions, comparable to the number specified.

Balancing valves are based on Bell & Gossett models. Equivalent style valves by Armstrong, Flowset, Nibco, Taco, or Victaulic/TA Hydronics are acceptable.

Shutoff Valves:

Except as otherwise specified, all shutoff valves 2-1/2 inch and smaller shall be ball valves and shutoff valves 3 inch and larger shall be butterfly valves, unless required otherwise by local Water Utility specifications.

Ball Valves:

Bronze, two piece full port ball valves with bronze body, solder or threaded ends, chromium plated brass or stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-585-70. Include handle extension for insulated piping, NIB-SEAL by Nibco.

Bronze, two piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-585-70-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

Bronze, three piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-595-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

Butterfly Valves:

Ductile iron butterfly valve, polymid coated, EPDM elastomer coated disc, extended neck, grooved ends, 300 psi WOG pressure rated, Nibco GD 4765. Include lever handle through 6-inch size and gear operator for 8 inch and larger size.

Cast bronze butterfly valve, EPDM elastomer coated ductile iron disc, copper tube dimensioned grooved ends, 300 psi maximum pressure rated, Victaulic Series 608. Include lever handle through 6-inch size.

Check Valves:

3" and Smaller:

Bronze body, Class 125, Y-pattern, swing type, check valve with solder ends, all bronze internal components and renewable seat and disc, Nibco model S-413-B.

2" and Smaller:

Bronze body, ASTM B62, in-line lift type, spring, Buna-N disc, 250 psig WOG rating. Nibco 480

Balancing Valves:
½" thru 2":
Bronze body balancing valve with sweat or threaded ends, calibrated brass orifice, integral adjustment knob with calibrated scale, memory stop indicator, drain tapping and differential pressure metering connections, Bell & Gossett "Circuit Setter".

Ametal® brass copper alloy, y-pattern, globe type balancing valve with soldered or threaded ends, EPDM o-ring seals, 4-turn digital readout hand wheel with locking, tamper-proof setting, and differential pressure metering connections, separate shutoff valve not required, 300 psi at 250 deg F. Victaulic/Tour & Andersson Series 786, 787 & 78K balancing valves with Victaulic Series 799 or 79V Koil-Kit™ coil pack consisting of Victaulic Series 78U union port fitting, Series 78Y strainer/ball valve or Series 78T union/ball valve combination, and flexible hoses to complete terminal hookup at coil outlet.

UNIONS AND FLANGES
Unions:
Bronze, solder connection, Nibco figure 733.

Flanges:
Cast copper alloy, class 125, MSS SP-106, Nibco figure 741.

DIELECTRIC COUPLINGS
Steel casing, zinc electroplated, with inert thermoplastic lining, various end types, Clearflow, style 47 by Victaulic.

Dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets and pressure rating of not less than 175 psig at 180 degrees Fahrenheit. Watts Regulator Company, Lochinvar, Wilkins, Epco Sales, Inc.

WATER HAMMER SUPPRESSORS
Acceptable manufacturers are MIFAB, PPP, Sioux Chief, and Watts.

Piston compressed air column type, with sealed air chamber.

Water supply piping serving fixtures, appliances, equipment and devices with quick closing and/or solenoid-actuated valves shall be provided with water hammer arrestors. Also provide where indicated on the water supply piping as shown on the water supply isometrics. Devices shall be mechanical arrestors installed in accordance with PDI Standard WH201. Air chambers are not considered to be equal.

Shop drawings are required. Submit to A/E for approval prior to installation.

Water hammer arrestors must be accessible for inspection and replacement. Provide access panel.

PART 3 - EXECUTION

WATER PIPING SYSTEM
Piping shall be pitched to drain entire system; install drain valves at low points. Provide unions at equipment and valves. Provide offsets and transition fittings as required. Avoid dips or depressions in pipe runs.

No water piping shall be installed in exterior walls, unless adequately protected from freezing. Two inch insulation shall be installed on back and sides of chase, front shall be open to room heat, covered only by finished wall material.

Install unions, couplings, or flanges at all final equipment connections and as required to facilitate removal of equipment.

Install dielectric couplings at every connection between copper pipe and other metals. Use dielectric unions for connecting copper and steel piping.

Hot water and cold water lines shall be kept at least 6 inches apart whenever possible.

Grooved Joints:
Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. Grooved couplings, fittings and valves shall be of the same manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use if grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.

Keep fittings free of dirt and oil; use only on potable water or oil-free compressed air systems.

Mechanically Formed Tee Fittings:
Form mechanically extracted collars in continuous operation of consisting of drilling pilot hole out of tube surface to form collar, having height of not less than 3 times thickness of tube wall. Use adjustable collaring device. Notch and dimple branch tube.

To form couplings, anneal end of tubing to be expanded, insert expander and reform tube to accept size OD. Socket expansion shall be at least 3 times base tube wall thickness in depth.

Braze joints and couplings in accordance with American Welding Society "lap joint" weld, and Copper Development Association copper tube handbook using BCup filler metal. Soft solder joints will not be permitted with mechanical tee fittings joints.

Pressure-Sealed Fittings:
Stainless steel pipe shall be square cut, +/- 0.030", properly deburred and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a tool provided by the Manufacturer with the proper sized jaw for pressing (Victaulic "PFT" Series).

Hot Water Re-Circulating System:
Install return system including check valves and balancing valves as shown on documents. Pitch and grade all lines as required to ensure satisfactory circulation.

Adjust each balancing valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature and to provide continuous circulation throughout building. Provide balancing report along with O&M manual submittals. Test and demonstrate to A/E upon request.

Valve Installation:
Install shutoff valves with stem vertical. Exception; the stem may be horizontal if a vertical installation would not allow access to the valve handle

All valves with screwed ends shall be installed using "Teflon" tape applied on male portion of piping fitting.

Each individual fixture or piece of equipment shall have an independent shut-off valve adjacent to fixture in addition to the required branch shut-off. Where valves are installed in walls an access panel shall be provided.

Branches:
Valve shut-off full size of branch for each branch take-off to supply stack or fixture group.

Drains:
Provide valved drains at low points of systems as required or directed. All piping shall be arranged to drain through valved drains.

Flushing Mains and Branch Piping:
Upon completion of the water distribution system, test all valves to insure their full opening and flush out the system progressively by opening drain valves and building outlets and permitting the flow to continue from each until the water runs clear.

Pipe Insulation:
Provide pipe insulation for all domestic water piping per Section 22 07 00.

Sterilization of Water Distribution System:
As soon as the water distribution system has been flushed out as above specified, it shall be sterilized in accordance with the requirements of the local Health Department/Water Utility or in the absence of such, by the following method:

Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine, as determined by residual chlorine tests at the ends of the lines. Open and close all valves and hydrants while the system is being chlorinated.

After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 5 PPM as indicated, repeat the sterilization process.

When tests show at least 5 PPM of residual chlorine flush out the system until all traces of the chemical used are removed.

Samples
After disinfecting the water distribution system, take water samples to check for bacteria. Take 5 water samples from remote faucets, plus the main entrance. Send the samples to the Wisconsin Department of Health Lab to sample for a safe water supply system.

TESTING
Refer to Division 01, "Starting of Systems" and Section 22 05 00.

Hydro-statically pressure test water piping to 150 psig for 4 hours. No decrease in pressure is allowed. Provide pressure gauge with shutoff and a bleeder valve at the highest point of the system tested. Inspect joints in system under test. No leaks allowed.

Do not conceal pipe until satisfactorily tested.

Testing with air will not be allowed.

END OF SECTION

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SECTION 22 13 00
FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 – GENERAL
- Scope
- Related Work
- Description
- Quality Assurance
- Submittals

PART 2 – PRODUCTS
- Above Ground Pipe and Fittings
- Drains and Cleanouts

PART 3 - EXECUTION
- Drain and Vent Piping System
- Pipe Joints
- Plenum Ceiling Spaces
- Safings
- Cleanouts
- Traps
- Testing

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

22 05 00 – Common Work Results for Plumbing
22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

DESCRIPTION

Interior sanitary waste and vent and acid drain and vent piping systems including branches, drains, cleanouts, stacks, fittings and hardware.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

SUBMITTALS

Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.

Schedule from the contractor indicating the ASTM, or CISPI specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, and identification as referenced in this section and/or on the drawings.

PART 2 - PRODUCTS

ABOVE GROUND PIPE AND FITTINGS

Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM C564, and stainless-steel clamp, CISPI 310. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping and fittings shall be manufactured by AB&I, Charlotte, or Tyler.

PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with solvent weld joints, ASTM D2855. Solid wall PVC only.

Optional Materials for Piping 2" and Smaller:

Copper drainage tube, Type DWV, ASTM B-306; wrought copper and cast brass drainage fittings with soldered joints.

DRAINS AND CLEANOUTS

Drains and cleanouts manufactured by J.R. Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or Zurn.

Refer to Plumbing Drain and Cleanout Schedule.

PART 3 - EXECUTION

DRAIN AND VENT PIPING SYSTEM

Connect all drain and vent piping to each fixture and piece of equipment and install all required piping as shown on drawings. Provide all necessary fittings and hardware to make required offsets and transitions.

Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.

Fittings to be installed to make for the least possibility of stoppage. All horizontal drainage piping less than 3 inches shall be pitched a minimum of 1/4 inch per foot of run. Pitch drainage piping 3 inch and larger a minimum of 1/8" per foot of run.

Connect to all drains, fixtures and equipment as required.

PIPE JOINTS

Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards 301, 310, and in their publication "Installation Suggestions for Cast Iron No-Hub Pipe and Fittings".

Prepare PVC pipe ends as recommended by manufacturer. Use a P-70 type primer (for PVC) and a PVC solvent cement appropriate to the pipe size and temperature range.

Soldered joints shall be as described in Section 22 05 00.

PLENUM CEILING SPACES

PVC piping shall not be installed in spaces used as air plenums. Review HVAC drawings and specifications to determine exact locations of areas used as air plenums.

SAFINGS

Manufacturers: Noble, Oatey.

Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, joined with CPE solvent; or 3 lb./sq. ft. sheet lead.

Install safing at floor drains above grade. Extend 12" beyond drains in all directions. Cover entire floor in showers and extend 6" up in walls above curbs and to a height of 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test. Install safing at all built-up shower installations. (Note: spray-on and brush applied liquid safing is not acceptable).

CLEANOUTS

Provide and install cleanouts as shown on plans and as required by Code.

TRAPS

Trap all fixtures and equipment. Trap seals shall be standard depth, except when deep seals are required by Code. Traps shall be set true and level and located within the limits of the Code requirements. A trap shall not be used as a separator, interceptor or other type of device to retain solids. All traps above grade shall be provided with approved screw-type cleanout plugs.

Traps shall be protected during construction and sealed to prevent foreign matter from entering. Provide adjustable expansion plug, plastic cap, or approved equivalent.

TESTING

Refer to Testing paragraph of Section 22 05 00.

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.

END OF SECTION

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SECTION 22 14 00
FACILITY STORM DRAINAGE

PART 1 - GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 – GENERAL
- Scope
- Related Work
- Description
- Quality Assurance
- Submittals

PART 2 – PRODUCTS
- Above Ground Pipe and Fittings
- Drains and Cleanouts

PART 3 - EXECUTION
- Drain and Vent Piping System
- Pipe Joints
- Plenum Ceiling Spaces
- Cleanouts
- Testing

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

22 05 00 – Common Work Results for Plumbing
22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

DESCRIPTION

Interior storm drainage, clear-water waste and vent piping systems including branches, drains, cleanouts, stacks, fittings and hardware.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

SUBMITTALS

Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.

Schedule from the contractor indicating the ASTM, or CISPI specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, and identification as referenced in this section and/or on the drawings.

PART 2 - PRODUCTS

ABOVE GROUND PIPE AND FITTINGS

Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping and fittings shall be manufactured by AB&I, Charlotte, or Tyler.

PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with solvent weld joints, ASTM D2855. Solid wall PVC only.

DRAINS AND CLEANOUTS

Drains and cleanouts manufactured by J.R. Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or Zurn.Refer to Plumbing Drain and Cleanout Schedule.

PART 3 - EXECUTION

DRAIN AND VENT PIPING SYSTEM

Connect all drain and vent piping to each fixture and piece of equipment and install all required piping as shown on drawings. Provide all necessary fittings and hardware to make required offsets and transitions.

Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.

Fittings to be installed to make for the least possibility of stoppage. All horizontal drainage piping less than 3 inches shall be pitched a minimum of 1/4 inch per foot of run. Pitch drainage piping 3 inch and larger a minimum of 1/8" per foot of run.

Connect to all drains, fixtures and equipment as required.

PIPE JOINTS

Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards 301, 310, and in their publication "Installation Suggestions for Cast Iron No-Hub Pipe and Fittings".

Prepare PVC pipe ends as recommended by manufacturer. Use a P-70 type primer (for PVC) and a PVC solvent cement appropriate to the pipe size and temperature range.

Soldered joints shall be as described in Section 22 05 00.

PLENUM CEILING SPACES

PVC piping shall not be installed in spaces used as air plenums. Review HVAC drawings and specifications to determine exact locations of areas used as air plenums.

CLEANOUTS

Provide and install cleanouts as shown on plans and as required by Code.

TESTING

Refer to Testing paragraph of Section 22 05 00.

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.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

SCOPE

This section includes specifications for plumbing fixtures, faucets and trim for this project. Included are the following topics:

PART 1 – GENERAL
- Scope
- Related Work
- Description
- Reference Standards
- Quality Assurance
- Submittals

PART 2 – PRODUCTS
- General
- Manufacturers

PART 2 - EXECUTION
- Installation

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

Section 22 05 00 – Common Work Results for Plumbing
Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment
Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage

DESCRIPTION

Furnish and install plumbing fixtures with traps, drains, stops, faucets, flush valves, carriers and hardware.

REFERENCE STANDARDS

ANSI A112.6.1M-88	Supports for Off-the Floor Plumbing Fixtures for Public Use.
ANSI A112.18.1-94	Finished and Rough Brass Plumbing Fixture Fittings.
ARI-1010-94	Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
ASSE 1011-93	Hose Connection Vacuum Breakers.

QUALITY ASSURANCE

Substitution of Materials: Refer to 22 05 00 and Division 01 of the Project Manual.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SUBMITTALS

Submit product data sheets in accordance with Division 01 and Section 22 05 00.

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

GENERAL

Fixtures must conform to general requirements given below and to specified requirements for each type.

Stainless steel fixtures shall conform to ANSI A112.19.3.

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.

Faucets, traps, exposed fittings and trim shall be polished chrome plated unless otherwise specified. Provide polished chrome plated nipples at all lavatories.

Exposed piping penetrating walls, floors or ceilings shall have chrome plated escutcheons, or flanges of sufficient depth to seal the opening.

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.

Traps shall be semi-cast 17-gauge brass, chrome plated, with cleanout and escutcheon. Sink traps shall be 1-1/2" minimum.

MANUFACTURERS

Carriers for wall-mounted fixtures shall be manufactured by J.R. Smith, Josam, MIFAB, Wade, Watts, or Zurn.

Drinking fountains and electric water coolers shall be manufactured by Acorn Aqua, Elkay, Filtrine, Halsey Taylor, Haws, Oasis, or Sunroc.

Stainless steel sinks shall be manufactured by Advance-Tabco, Elkay, or Just.

Stainless steel scrub sinks shall be manufactured by Acorn, Bradley, or Willoughby.

Manual faucets shall be manufactured by American Standard, Chicago Faucet, Kohler, Moen Commercial, Speakman, Symmons, T&S Brass, Sloan (Polaris), or Zurn.

Electronic sensor operated faucets shall be manufactured by Bradley, Chicago Faucet, Kohler, Sloan, Speakman, or Zurn.

Heavy duty stops and supplies shall be manufactured by Chicago Faucet, Dearborn, EBC, Kohler, McGuire, T&S Brass, or Zurn.

Lavatory drains shall be offset type, 1-1/4” size, with flat grid strainer, manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.

Traps shall be semi-cast 17 gauge brass, chrome plated, with cleanout and escutcheon as manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.

Supply, drain and trap insulating kits shall be manufactured by Brocar, EBC, McGuire, Plumberex, or Truebro.

Fixtures:

See Plumbing Fixture Schedule on drawings for type, manufacturer, and model for fixtures.

PART 3 - EXECUTION

INSTALLATION

Install plumbing fixtures in accordance with manufacturer’s instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing. Individual supplies to fixtures shall be provided with support to prevent movement.

Install barrier free fixtures in compliance with COMM 52, 69 and Federal ADA Accessibility Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops elevated to avoid contact by wheelchair users.

Seal joints between countertop, wall, floor and fixtures with G.E. Silicone caulk; white, clear or color to match fixture with colored caulk by fixture manufacturer.

Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

After installation, fixtures shall be protected to prevent scratching or other damage during construction.

Prior to acceptance, fixtures shall be cleaned with compounds recommended by the respective manufacturer.

END OF SECTION

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SECTION 23 01 30.51
HVAC AIR DUCT CLEANING

P A R T 1 - G E N E R A L

SCOPE

This section includes specifications for cleaning duct and HVAC systems on this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- General
- Cleaners and Encapsulants
- Equipment
- Access Doors

PART 3 - EXECUTION
- General
- Cleaning
- Encapsulants
- Cleaning Report
- Access Doors

RELATED WORK

Section 23 33 00 - Air Duct Accessories
Section 23 31 00 - HVAC Ducts and Casings
Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

NADCA 1992-01	Mechanical Cleaning of Non-Porous Air Conveyance System Components National Air Duct Cleaners Association
NADCA	Understanding Microbial contamination in HVAC Systems
NAIMA	Cleaning Fibrous Glass Insulated Air Duct Systems

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

A Regular Member in good standing of NADCA (National Air Duct Cleaners Association). Maintain membership for the entire duration of the project. Maintain a staff of at least one Certified Air System Cleaning Specialist (ASCS). If membership of the firm, or any certification of any staff performing work is terminated or expires during the duration of the project, contact DFD immediately.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Include manufacturer's data and/or Contractor data for the following:
- List of equipment to be used.
- Product description and MSDS sheets for cleaners, biocides and encapsulants.
- Access doors.

PART 2 - PRODUCTS

GENERAL
Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

CLEANERS AND ENCAPSULANTS
Manufacturer: H.B. Fuller/Foster, Porter, or approved equal.

Cleaners and encapsulants shall be waterbase products specifically designed for application to HVAC duct interiors and capable of being applied with airless spray equipment. Encapsulants must be colored differently than substrate to be coated.

EQUIPMENT
Particulate Collection Equipment: Fan/filter unit sized to create sufficient quantity of negative pressure for capture and filtration of air and contaminants dislodged during duct cleaning. Equipment to include prefiltration and HEPA final filtration with 99.97% collection efficiency for 0.3 micron size particles.

Portable pressure washers to be capable of 500 psig to 1000 psig operation.

Power brush systems designed specifically for duct cleaning.

PART 3 - EXECUTION

GENERAL
Use products and equipment in accordance with manufacturers instructions.

CLEANING
Clean ductwork systems and associated turning vanes, dampers and plenums as described below:

System/Component	Location	Action
Supply Duct (Existing)	Note (1)	Clean
Return Duct (New and Existing)	Note (2)	Clean

(1) Clean existing supply duct from air handler on 4th floor, thru vertical chase to 5th floor.
(2) Clean all new return duct on 5th floor. Clean all existing return duct from 5th floor to air handler located on 4th floor.

Visually inspect systems and site prior to cleaning. Document and report damaged system components to Owner's Construction Representative prior to cleaning. Mark damper and other component positions prior to cleaning and reset after cleaning to original position. Establish a specific, coordinated plan detailing how each area of the building will be protected during the various phases of work.

Protect building occupants, components and furnishings from cleaning activities. Use polyethylene sheeting covers and barriers where cleaning will disperse debris outside the HVAC systems. Install critical barriers within the building, at inlets/outlets and within the system to prevent migration of dust and debris to clean areas.

Use particulate collection equipment to remove and capture debris. Connect to system downstream of cleaning operations. Wherever possible, duct exhaust to the exterior of the building. Avoid discharge near air intakes and points of entry. Arrange source of makeup air to flow from clean area to work area negatively pressurizing work area. Take measures to control offensive odors and vapors during the cleaning process.

Clean systems using mechanical cleaning methods, such as vacuum cleaning, compressed air sweeping and mechanical brushing, designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. No cleaning methods are to be used which damage components of the system or negatively alter the integrity of the system.

Clean fibrous glass thermal or acoustical insulation with HEPA vacuuming equipment. Document locations of damage, deterioration, delamination, mold, fungus growth or excessive moisture which cannot be restored by cleaning or resurfacing with repair coating. Report locations and conditions to Architect/Engineer and Owner's Project Representative for determination of removal and/or replacement.

Where fibrous glass thermal or acoustical insulation is to be removed, scrape and brush metal clean. Remove loose fasteners, weld pins where required for cleaning work and sheet metal covers associated with insulation. Patch and seal fastener openings.

Where systems and equipment containing filters are cleaned, obtain replacement filters from building occupant and replace existing filters.

Verification of HVAC system cleanliness will be performed after cleaning and prior to application of biocides and encapsulants. The Contractor shall notify the Owner's Construction Representative and Architect/Engineer in advance of verification. Verification will consist of inspection by the Contractor, Owner's Construction Representative and/or Architect/Engineer. If surfaces are visibly clean, no contaminants are evident through visual inspection and coils are within 10% of design pressure drop, the HVAC system shall be considered clean. However the Owner reserves the right to further verify system cleanliness through third party gravimetric or wipe testing analysis per NADCA standards.

ENCAPSULANTS

Encapsulants are to be applied only after cleaning and verification have been completed and surfaces are dry. System fans are to remain off and critical barriers maintained to prevent migration of biocides and encapsulants from the HVAC systems.

Apply encapsulants to the following surfaces where microbial contamination is not suspected:

Damaged fibrous glass thermal or acoustical insulation.
Sheet metal where thermal or acoustical insulation has been removed.

Encapsulants to be directly sprayed (not fogged), brushed or rolled onto surfaces to achieve a continuous film of thickness recommended by manufacturer. Increase application rate on porous or rough surfaces. Protect coils, fan blades, bearings, damper linkages and seals, fire/smoke dampers, humidifiers, airflow sensors, pressure sensors, temperature sensors and humidity sensors during application of encapsulants. Clean any overspray from these components immediately. Allow products to fully cure prior to using HVAC systems. Operate systems during unoccupied hours flushing with fresh air to purge system prior to occupied use.

CLEANING REPORT

Provide a report describing pre-cleaning inspection and damage, systems cleaned, methods and materials used, problems encountered, final verification and any remaining problems noted. Submit three copies to Owner's Construction Representative.

ACCESS DOORS

Install access doors where indicated on the drawings and in locations where access is required for cleaning or inspection. See specification Section 23 33 00 for access door requirements.

Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils if not existing.

END OF SECTION

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SECTION 230500
COMMON WORK RESULTS FOR HVAC

P A R T 1 - G E N E R A L

SCOPE

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:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing and Firestopping
- Equipment Furnished By Others
- Provisions for Future
- Submittals
- Off Site Storage
- Certificates and Inspections
- Operating and Maintenance Data
- Record Drawings
- Commissioning

PART 2 - PRODUCTS
- Access Panels and Doors
- Identification
- Sealing and Firestopping

PART 3 - EXECUTION
- Demolition
- Concrete Work
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Lubrication
- Sleeves
- Sealing and Firestopping

RELATED WORK

Section 23 05 13 - Common Motor Requirements for HVAC.
Section 23 33 00 - Air Duct Accessories.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in other sections are as follows:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers

ASTM	American Society for Testing and Materials
CGA	Compressed Gas Association
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
UL	Underwriters Laboratories Inc.
ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

CONTINUITY OF EXISTING SERVICES

Do not interrupt or change existing services without prior written approval from County Facilities Personnel. When interruption is required, coordinate the down-time with Facilities to minimize disruption to their activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES

Refer to Division 1, General Requirements, Protection of Installed Construction

Furnish one can of touch-up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

SLEEVES AND OPENINGS

Refer to Division 1, General Requirements, Cutting and Patching.

SEALING AND FIRESTOPPING

Sealing and firestopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

EQUIPMENT FURNISHED BY OTHERS

None.

PROVISIONS FOR FUTURE

None.

SUBMITTALS

Refer to Division 1, General Conditions, Submittals.

Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents.

Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the motor starter schedule are in agreement or indicate any discrepancies.

Include wiring diagrams of electrically powered equipment.

Provide electronic (PDF) copies of shop drawings for electronic distribution.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under this section and under Division 1, General Requirements, Closeout Procedures.

CLOSEOUT PROCEDURES

Refer to this section and under Division 1, General Requirements, Closeout Procedures.

OFF SITE STORAGE

Ductwork, metal for making ductwork, duct lining, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off site storage. For material that can be stored off site, no material will be accepted for offsite storage unless shop drawings for that material have been approved.

CERTIFICATES AND INSPECTIONS

Refer also to Division 1, General Requirements, Regulatory Requirements.

Obtain and pay for all required City of Madison installation inspections except those provided by the Architect/Engineer in accordance with Wis Adm Code Section ILHR 50.12. Deliver originals of these certificates to the Owner and A/E. Include copies of the certificates in the Operating and Maintenance Instructions.

OPERATING AND MAINTENANCE INSTRUCTIONS

Refer to Division 1, General Requirements, Operating and Maintenance Instructions.

Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

- Copies of all approved shop drawings.
- Manufacturer's wiring diagrams for electrically powered equipment
- Records of tests performed to certify compliance with system requirements
- Certificates of inspection by regulatory agencies
- Temperature control record drawings and control sequences
- Parts lists for manufactured equipment
- Valve schedules
- Lubrication instructions, including list/frequency of lubrication done during construction
- Warranties
- Additional information as indicated in the technical specification sections

Also, provide electronic (PDF) copy of Operation and Maintenance Manual on “thumb” drive or DVD.

TRAINING OF OWNER PERSONNEL

Instruct County Facility Personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video tape all training sessions. Include not less than 4 hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment.

All training to be during normal working hours.

RECORD DRAWINGS

Refer to Division 1, General Requirements, Record Drawings.

In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

COMMISSIONING

This project will not be commissioned.

P A R T 2 - P R O D U C T S

ACCESS PANELS AND DOORS

LAY-IN CEILINGS:
Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Section 09500 are sufficient; no additional access provisions are required unless specifically indicated.

PLASTER WALLS AND CEILINGS:
16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

IDENTIFICATION
STENCILS:
Not less than 1 inch high letters/numbers for marking pipe and equipment.

SNAP-ON PIPE MARKERS:
Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services, or equal.

ENGRAVED NAME PLATES:
White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

VALVE TAGS:
Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, Marking Services, or W. H. Brady.

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Manufacturers:
3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.

All firestopping systems shall be provided by the same manufacturer.

Submittals:
Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

Product:
Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.

Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

NON-RATED PENETRATIONS:

Pipe Penetrations:
At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

Duct Penetrations:
Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation. Provide 4" sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.

P A R T 3 - E X E C U T I O N

DEMOLITION
Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the user agency to minimize disruption to the existing building occupants.

All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the user agency. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

CUTTING AND PATCHING
Refer to Division 1, General Requirements, Cutting and Patching.

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

EQUIPMENT ACCESS
Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.

Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

COORDINATION
Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.

Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, duct and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work.

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

Identify piping not less than once every 20 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background for stenciling, or provide snap-on pipe markers as specified in Part 2 – Products.

Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms to be framed under clear plastic.

Use engraved name plates to identify control equipment.

LUBRICATION

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

SLEEVES

PIPE SLEEVES:

Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall.

Pipe sleeves are not required in interior non-rated drywall, plaster or wood partitions and sleeves are not required in existing poured concrete walls where penetrations are core drilled.

Pipe sleeves are not required in cored floor pipe penetrations through existing floors that are not located in mechanical rooms, food service areas or wet locations listed above.

DUCT SLEEVES:

Duct sleeves are not required in non-rated partitions or floors.

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Install approved product in accordance with the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

NON-RATED PARTITIONS:

At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

Duct penetrations through non-rated partitions shall require sheet metal escutcheons with fiberglass or mineral wool insulation fill for spaces that include laboratories, clean rooms, animal rooms, kitchens, cart wash rooms, janitor closets, cart wash rooms, toilet rooms, mechanical rooms, conference rooms, private consultation rooms, and where noted on drawings elsewhere.

END OF SECTION

SECTION 230515
PIPING SPECIALTIES

P A R T 1 - G E N E R A L

SCOPE

This section contains specifications for HVAC piping specialties for all piping systems. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS
- Test Wells
- P/T (Pressure/Temperature) Test Plugs
- Hose Connection Caps
- Strainers
- Air Vents

PART 3 - EXECUTION
- Test Wells
- P/T (Pressure/Temperature) Test Plugs
- Strainers
- Air Vents

RELATED WORK

Section 23 21 13 - Hydronic Piping
Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

DESIGN CRITERIA

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

PART 2 - PRODUCTS

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

P/T (PRESSURE/TEMPERATURE) TEST PLUGS
Brass plug with 1/4" NPT threads, EPDM or neoprene valve core, knurled cap with cap strap. Use extended length plugs to clear insulated piping. Adaptors shall have 1/4" FPT connection for standard pressure gauges.

HOSE CONNECTON CAPS
Hose connection caps shall be pressure rated for 150 psig at 180 deg F.

STRAINERS
Manufacturers: Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

WATER SYSTEMS:
Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded body in sizes through 2 inch and rated at not less than 175 psi WOG; flanged body in sizes over 2 inch and rated at not less than 125 psi WOG at 240°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.125 inch perforations for line sizes 2-1/2 inch through 4 inch, and 0.25 inch perforations for line sizes 5 inch and larger.

STEAM SYSTEMS (15 PSIG AND LOWER):
Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blow off valve; threaded in sizes through 2 inch and rated at not less than 250 psi at 400°F; flanged in sizes over 2 inch and rated at not less than 125 psi at 350°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.050 inch perforations for line sizes over 2 inch.

AIR VENTS
MANUAL KEY TYPE VENTS:
Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.

Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 psig at 220°F.

MANUAL BALL VALVE VENTS:
Provide 1/4" ball valves for manual venting of air handling unit coils and where indicated elsewhere on drawings and details. Reference specifications section 23 05 23.

AUTOMATIC VENTS:
Thrush Model 720, Bell and Gossett Model 107, Watson McDaniel Model AV813W

Cast iron body with nonferrous internal parts, designed to vent air automatically with float principle without allowing air to enter the system, rated at not less than 125 psig at 220°F.

PART 3 - EXECUTION

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

P/T (PRESSURE/TEMPERATURE) TEST PLUGS
Install in piping systems as indicated on the drawings and/or details. Do not insulate over test plugs.

STRAINERS
Install all strainers where indicated on the project details, allowing sufficient space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

WATER SYSTEMS:
Install a ball valve for blowdown in the tapped screen retainer; valve to be the same size as the tapping.

STEAM SYSTEMS - LOW PRESSURE (15 PSIG AND LOWER):
Install a gate valve for blowdown in the tapped screen retainer; valve to be the same size as the tapping, suitable for system pressure (reference section 23 05 23).

AIR VENTS

MANUAL KEY TYPE VENTS:
Install at all high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting any water that might escape.

MANUAL BALL VALVE VENTS:
Install on air handling coils and where indicated elsewhere as shown on drawings and details.

AUTOMATIC VENTS:
Install on the top of air separators on systems using bladder type expansion tanks. Install at other locations as indicated on the drawings or details. All locations to have a ball valve installed upstream of the vent for maintenance purposes.

END OF SECTION

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SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

SCOPE

This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS
- Manufacturers
- Water System Valves
  - Gate Valves
  - Ball Valves
  - Butterfly Valves
  - Globe Valves
  - Balance Valves
  - Drain Valves
- Low Pressure Steam/Condensate (15 psig or less)
  - Gate Valves
  - Butterfly Valves
  - Globe Valves
  - Drain Valves
- Specialty Valves and Valve Accessories
  - Stem Extensions

PART 3 - EXECUTION
- General
- Shut-off Valves
- Balancing Valves
- Calibrated Balancing Valves
- Drain Valves

RELATED WORK

Section 23 05 15 - Piping Specialties
Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

SUBMITTALS

Refer to Division 1, General Conditions, Submittals.

Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under this Section, Section 23 05 00 and Division 1, General Requirements Closeout Procedures.

DESIGN CRITERIA
Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.) all valves shall be of the same manufacturer unless prior written approval is obtained from DFD.

P A R T 2 - P R O D U C T S

MANUFACTURERS
Anvil, Apollo, Armstrong, Bell & Gossett, Cash-Acme, Dresser Consolidated, Conval, Crane, Anderson Greenwood and Crosby, Danfoss-Flomatic, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond, Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer/Cincinnati, Metraflex, Milwaukee, Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol, Vogt, Watts, or approved equal.

WATER SYSTEM VALVES
All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.

GATE VALVES:
2" and smaller: Use ball valves; gate valves will not be accepted in sizes 2" and smaller.

BALL VALVES:
2" and smaller: Two piece bronze body; threaded or soldered ends, as appropriate to the pipe material; stainless steel or chrome plated brass/bronze ball; conventional port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Apollo 70-100/200 series, Hammond 8301/8311, Milwaukee BA100/150, Nibco T/S 585-70, Stockham S206/216.

BUTTERFLY VALVES:
2" and smaller: Use ball valves; butterfly valves will not be accepted in sizes 2 inch and smaller.

GLOBE VALVES:
Do not use globe valves for water service, except in temperature control applications.

BALANCE VALVES:
2" and smaller: Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F.

Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswold Quickset, Nexus Orturi, Nibco 1710 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD, Victaulic series 786/787.

Include one bellows type differential pressure meter kit that includes a six inch diameter gauge with 270° arc readout and having an accuracy of ±1% of full scale or better and suitable for the differential pressures of the valves supplied for this project, over-range protection, color coded hoses not less than ten feet in length with brass connectors suitable for connection to the low and high pressure connections on the balance valves, instrument valving so meter can be vented and drained, pressure and temperature rating at least equal to that of the valves. Provide meter and all accessories in a durable case with carrying handle.

Barton 247A, Midwest 809.

DRAIN VALVES:
Use 3/4 inch ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection.

LOW PRESSURE STEAM/CONDENSATE (15 psig or less)

GATE VALVES:
2" and smaller: Class 150, bronze body, bronze trim, threaded ends, solid wedge, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

Crane 431UB, Hammond IB629, Milwaukee 1151(M), Nibco T134, Lunkenheimer 3151, Powell 2714, Stockham B120.

2-1/2" and larger: Class 125, iron body, bronze trim, non-asbestos packing, bolted bonnet, O.S. & Y., solid wedge, flanged.

Crane 465-1/2, Hammond IR1140, Milwaukee F2885, Nibco F-617-O, Lunkenheimer 4330 IBBM, Powell 1793, Stockham G623.

BUTTERFLY VALVES:
3" and smaller: Use gate valves, butterfly valves are not acceptable in sizes 3" and smaller.

GLOBE VALVES:
2" and smaller: Class 150, bronze body, bronze trim, threaded ends, teflon disc, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

Crane 7TF, Hammond IB413T, Milwaukee 590T, Nibco T235, Lunkenheimer LQ600-150, Powell 150, Stockham B-22T.

DRAIN VALVES:
Use 3/4 inch, class 150 gate valve as specified for steam and condensate systems with threaded hose adapter. Strainer blowdown valves to be the same size at the blowdown connection.

SPECIALTY VALVES AND VALVE ACCESSORIES

STEM EXTENSIONS:
Provide stem extensions when valve operators interfere with pipe insulation.

P A R T 3 - E X E C U T I O N

GENERAL
Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

Install all temperature control valves.

Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down, will not be accepted.

Install stem extensions when shipped loose from valve.

Prior to flushing of piping systems, place all valves in the full-open position.

SHUT-OFF VALVES
Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

WATER SYSTEM:
Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

BALANCING VALVES
Provide balancing valves for all variable air volume terminal units and as indicated on drawings and details.

CALIBRATED BALANCE VALVES:
Install where indicated on the drawings and details for balancing of hydronic systems.

DRAIN VALVES

Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, other locations required for drainage of systems.

END OF SECTION

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

P A R T 1 - G E N E R A L

SCOPE

This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Description
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- Pipe Hanger and Support Manufacturers
- Structural Supports
- Pipe Hangers and Supports
- Beam Clamps
- Concrete Inserts
- Anchors

PART 3 - EXECUTION
- Installation
- Hanger and Support Spacing
- Anchors

RELATED WORK

Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation

REFERENCE

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

REFERENCE STANDARDS

MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at all hanger points; see Related Work above.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference section 23 05 00.

DESIGN CRITERIA
Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 unless noted otherwise.

Piping supported by laying on the bottom chord of joists or trusses will not be accepted.

Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

P A R T 2 - P R O D U C T S

PIPE HANGER AND SUPPORT MANUFACTURERS
Anvil, B-Line, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.

STRUCTURAL SUPPORTS
Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

PIPE HANGERS AND SUPPORTS
HANGERS FOR STEEL PIPE SIZES 1/2" THROUGH 2":
Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.

HANGERS FOR STEEL PIPE SIZES 2-1/2" AND OVER:
Carbon steel, adjustable, clevis, black finish. Anvil figure 260.

Adjustable steel yoke, cast iron roll, double hanger. Anvil figure 181.

MULTIPLE OR TRAPEZE HANGERS:
Steel channels with welded spacers and hanger rods if calculations are submitted.

WALL SUPPORT:
Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.

Perforated epoxy painted finish, 16-12 gauge min., steel channels securely anchored to wall structure with interlocking, split type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Anvil type AS200 H with AS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Anvil cushion clamp assembly.

COPPER PIPE SUPPORT:
Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.

INSULATION PROTECTION SHIELDS:
Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.

STEEL HANGER RODS:
Threaded both ends, threaded one end, or continuous threaded, black finish.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

Provide rods complete with adjusting and lock nuts.

BEAM CLAMPS
MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil figure 86.

MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Anvil figure 228.

CONCRETE INSERTS
Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

ANCHORS
Use welding steel shapes, plates, and bars to secure piping to the structure.

P A R T 3 - E X E C U T I O N

INSTALLATION
Install supports to provide for free expansion of the piping and duct 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.

Piping shall be supported independently from ductwork and all other trades.

Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes for the supporting steel.

Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

HANGER AND SUPPORT SPACING
Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of this specification.
Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Spacing
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

ANCHORS
Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

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SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC
For Informational Purposes Only

P A R T 1 - G E N E R A L

SCOPE
This section includes air and water testing, adjusting and balancing for the entire project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Description
- Submittals

PART 2 - PRODUCTS
- Instrumentation

PART 3 - EXECUTION
- Preliminary Procedures
- Balancing Scope
- Performing Testing, Adjusting and Balancing
- Deficiencies

RELATED WORK
Section 23 05 00 Common Work Results for HVAC
Section 23 07 00 HVAC Insulation
Section 23 09 14 Pneumatic and Electric Instrumentation and Control Devices for HVAC
Section 23 09 23 Direct Digital Control System for HVAC

REFERENCE
Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

REFERENCE STANDARDS

AABC	National Standards for Total System Balance, Sixth Edition, 2002.
ASHRAE	ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.
NEBB	Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.
TABB	Tab Procedural Guide, First Edition, 2003.

DESCRIPTION
Work related to the testing, adjusting, and balancing that must be performed by the installing mechanical contractor is specified in other section of these specifications.

Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings, electrical measurement and verification of performance of all mechanical equipment, all in accordance with standards published by AABC, NEBB, or TABB.

Test, adjust and balance all air and hydronic systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.

Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project.

Verify that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

QUALITY ASSURANCE

Qualifications
An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of 3 years. A Firm not engaged in the commerce of furnishing or providing equipment or material generally related to HVAC work other than that specifically related to installing Testing and Balancing components necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.

A certified member of AABC or certified by NEBB or TABB in the specific area of work performed. Maintain certification for the entire duration of the project. If certification of firm or any staff performing work is terminated or expires during the duration of the project, contact DFD immediately.

SUBMITTALS
Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB, AABC or TABB Certified Test and Balance Supervisor. The reports certify that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

Format: Cover page identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions:

- General Information
- Summary
- Air Systems
- Hydronic Systems
- Special Systems

Contents: Provide the following minimum information, forms and data:

- General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.

- Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.

- The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.

Distribution: Provide electronic (PDF) copies of test and balance report to A/E for review. Final approved copies of test and balance report shall be inserted into each Operation and Maintenance Manual.

P A R T 2 - P R O D U C T S

INSTRUMENTATION
Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB, AABC, or TABB Standards and instrument manufacturer's specifications.

All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB, AABC, or TABB Standards

PART 3 - EXECUTION

PRELIMINARY PROCEDURES

Review preconstruction meeting report, applicable construction bulletins, applicable change orders and approved shop drawings of equipment, outlets/inlets and temperature controls.

Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.

Identify deficiencies preventing completion of testing, adjusting and balancing procedures. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

BALANCING SCOPE

The following shall be tested, adjusted and balanced:

- All new air terminal (VAV) units (airflow and water flow)
- All new supply grilles.
- All new return grilles.

PERFORMING TESTING, ADJUSTING AND BALANCING

Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.

Unless specifically instructed in writing, all work in this specification section is to be performed during the normal workday.

In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tile for any tile that are damaged by this procedure. If the ceiling construction is such that access panels are required for the work of this section and the panels have not been provided, inform the owner's project representative.

Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

Measure and record system measurements at the fan and/or pump to determine total flow. Adjust equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed system.

Provide fan and motor drive sheave adjustments necessary to obtain design performance. Provide drive changes specifically noted on drawings, if any. If work of this section indicates that any drive or motor is inadequate for the application, advise the owner's project representative by giving the representative properly sized motor/drive information (in accordance with manufacturers original service factor and installed motor horsepower requirements); Confirm any change will keep the duct/piping system within its design limitations with respect to speed of the device and pressure classification of the distribution system. Required motor/drive changes not specifically noted on drawings or in specifications will be considered an extra cost and will require an itemized cost breakdown submitted to owner's project representative. Prior authorization is needed before this work is started.

Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

Final air system measurements to be within the following range of specified cfm:

Fans	0% to +10%
Supply grilles, registers, diffusers	0% to +10%
Return grilles, registers	0% to -10%

Final water system measurements must be within the following range of specified gpm:

Heating flow rates	0% to -10%

Contact the temperature control Contractor for assistance in operation and adjustment of controls during testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

Verify and record, in the T&B Report, "K" factors for all VAV air terminal devices and air flow stations.

DEFICIENCIES

Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. All corrective work to be done at no cost to the Owner. Retest mechanical systems, equipment, and devices once corrective work is complete as specified.

END OF SECTION

SECTION 230700
HVAC INSULATION

P A R T 1 - G E N E R A L

SCOPE

This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Description
- Definitions
- Shop Drawings
- Operation and Maintenance Data
- Environmental Requirements

PART 2 - PRODUCTS
- Materials
- Insulation Types
- Jackets
- Insulation Inserts and Pipe Shields
- Accessories

PART 3 - EXECUTION
- Examination
- Installation
- Protective Jacket Installation
- Piping, Valve and Fitting Insulation
- Piping Protective Jackets
- Pipe Insulation Schedule
- Duct Insulation
- Duct Insulation Schedule
- Equipment Insulation Schedule

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC
Section 23 21 13 - Hydronic Piping
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 31 00 - HVAC Ducts and Casings

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C195	Mineral Fiber Thermal Insulation Cement
ASTM C240	Cellular Glass Insulation Block
ASTM C302	Density of Preformed Pipe Insulation
ASTM C303	Density of Preformed Block Insulation
ASTM C355	Test Methods for Test for Water Vapor Transmission of Thick Materials
ASTM C449	Mineral Fiber Hydraulic Setting Thermal Insulation Cement
ASTM C518	Heat Flux and Thermal Transmission Properties
ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C547	Mineral Fiber Preformed Pipe Insulation
ASTM C552	Cellular Glass Block and Pipe Thermal Insulation

ASTM C553	Mineral Fiber Blanket and Felt Insulation
ASTM C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
ASTM C591	Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation
ASTM C612	Mineral Fiber Block and Board Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
ASTM D1000	Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D1621	Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D1622	Standard Test Method for Apparent Density of Rigid Cellular Plastics
ASTM D1940	Method of Test for Porosity of Rigid Cellular Plastics
ASTM D2126	Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM E84	Surface Burning Characteristics of Building Materials
ASTM E814	Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E2336	Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

Insulation systems shall be applied by experienced contractors. Within the past five (5) years, the contractor shall be able to document the successful completion of a minimum of three (3) projects of at least 50% of the size and similar scope of the work specified in this section.

DESCRIPTION

Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:

- Pipe Insulation
- Duct Insulation
- Equipment Insulation

Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the DFD Project Representative.

DEFINITIONS

Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under Section 23 05 00 and Division 1, General Requirements, Closeout Procedures.

ENVIRONMENTAL REQUIREMENTS

Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install insulation products that have been exposed to water.

Protect installed insulation work with plastic sheeting to prevent water damage.

PART 2 - PRODUCTS

MATERIALS

Manufacturers: Armacell, Certainteed, Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, Imcoa, Johns Manville, Knauf, Owens-Corning, Partek, Pittsburgh Corning, Rubatex, VentureTape or approved equal.

Materials or accessories containing asbestos will not be accepted.

Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 450 when tested in accordance with UL 723 and ASTM E84.

INSULATION TYPES

Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

FLEXIBLE FIBERGLASS INSULATION:
Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.3 at 75 degrees F, rated for service to 250 degrees F.

RIGID FIBERGLASS INSULATION:
Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

JACKETS

PVC FITTING COVERS AND JACKETS (PFJ):
White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be minimum .02” indoors/.03”outdoors for piping 12” and smaller, .03” indoors/.04” outdoors for piping 15” and larger.

ALL SERVICE JACKETS (ASJ):
Heavy duty, fire retardant material with white kraft reinforced foil vapor barrier, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

Jacket shall be paintable.

FOIL SCRIM ALL SERVICE JACKETS (FSJ):
Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms and minimum beach puncture resistance of 25 units.

INSULATION INSERTS AND PIPE SHIELDS

Manufacturers: B-Line, Pipe Shields, Value Engineered Products

Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300 degrees F only), minimum 140 psi compressive strength. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered/premanufactured product described above. On low temperature systems, high density rigid polyisocyanurate may be substituted for calcium silicate provided insert and shield length and shield gauge are increased to compensate for lower insulation compressive strength.

Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1"x6" block for piping through 2-1/2" and three 1"x6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-engineered/premanufactured product described above.

Wood blocks will not be accepted.

ACCESSORIES

All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be .015 inch for aluminum and .010 inch for stainless steel.

Tack fasteners to be stainless steel ring grooved shank tacks.

Staples to be clinch style.

Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

Finishing cement to be ASTM C449.

Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

Bedding compounds to be non-shrinking and permanently flexible.

Vapor barrier coatings to have maximum applied water vapor permeance of .05 perms.

Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

P A R T 3 - E X E C U T I O N

EXAMINATION

Verify that all piping, equipment, and ductwork are tested and approved prior to installing insulation. Do not insulate systems until testing and inspection procedures are completed.

Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

Fix and repair any existing insulation damaged during demolition and new construction. Provide continuous insulation and locations where existing walls/partitions have be removed and existing insulation was not previously continuous thru removed wall/partition.

INSTALLATION

All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards. Do not install products when the ambient temperature or conditions are not consistent with the manufacturer's recommendations. Surfaces to be insulated must be clean and dry.

Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.

Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.

Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

All pipe and duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves except where firestop or firesafing materials are required. Vapor barriers shall be maintained continuous through all penetrations.

Provide a continuous unbroken moisture vapor barrier on insulation applied to systems noted below. Attachments to cold surfaces shall be insulated and vapor sealed to prevent condensation.
Provide a complete vapor barrier for insulation on the following systems:

- Insulated Duct
- Equipment, ductwork or piping with a surface temperature below 65 degrees F

PROTECTIVE JACKET INSTALLATION

SELF-ADHERING JACKETS (SAJ):
Install according to manufacturer's recommendations. Cut allowing minimum 4" overlap on ends and 6" on longitudinal joints. Align parallel to surface. Remove release paper and press flat to surface to avoid wrinkles. Rub entire surface for full adhesion and sealing at joint overlaps. On exterior applications, provide a bead of compatible caulk along exposed edges.

Piping with self-adhering (SAJ) jackets shall have elbows, fittings, valves and butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the self-adhering (SAJ) jacket may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

VAPOR RETARDING JACKETS (VRJ):
Piping with vapor retarding (VRJ) jackets shall have elbows, fittings, valves and butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the vapor retarding (VRJ) jackets may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

PVC FITTING COVERS AND JACKETS (PFJ):
Lap seams and joints a minimum of 2 inches and continuously seal PVC with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used. Secure PVC fitting covers with tack fasteners. For systems requiring a vapor barrier, apply a 1-1/2" band of mastic over ends, throat, seams and penetrations.

PIPING, VALVE, AND FITTING INSULATION

GENERAL:
Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive unless otherwise noted. Additionally secure with staples along seams and butt joints. Coat staples, longitudinal and transverse seams with vapor barrier mastic on systems requiring vapor barrier.

Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required or where roller hangers are not being used, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous through the hangers and supports. High density inserts shall be provided as required to prevent the weight of the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall not be notched or cut to accommodate the supporting channels.

Fully insulate all reheat coil piping, fittings and valves (with the exception of unions) up to coil connection to prevent condensation when coil is inactive during cooling season. Provide a vapor proof seal between the pipe insulation and the insulated coil casing.

INSULATION INSERTS AND PIPE SHIELDS:
Provide pipe shields at all hanger and support locations. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Quantity and placement of inserts shall be according to the manufacturer's installation instructions, however the inserts shall be no less than 12" in length. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required for system.

Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

FITTINGS AND VALVES:
Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation. Where the ambient temperature exceeds 150 degrees F, cover insulation with fabric reinforcing and mastic. Where the ambient temperatures do not exceed 150 degrees, furnish and install PVC fitting covers.

ELASTOMERIC AND POLYOLEFIN:
Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyeolefin, seal factory preglued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces. Cover elastomeric insulation on systems operating below 40 degrees F with vapor barrier mastic.

PIPING PROTECTIVE JACKETS
In addition to the jackets specified in the pipe insulation schedule below the following protective jackets are required:

Provide a protective PVC jacket (PFJ) for the following insulated piping:
- Piping exposed in finished locations

PIPE INSULATION SCHEDULE:
Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation	Jacket	Insulation Thickness by Pipe Size			
			≤ 1-1/4"	1-1/2"	2" to 4"	4" to 6"
Heating Hot Water	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"
Low Pressure Steam	Rigid Fiberglass	ASJ	2.5"	2.5"	2.5"	2.5"
Steam Condensate	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"

The following piping and fittings are not to be insulated:
- Steam/Condensate piping inside radiation, convector, or cabinet heater enclosures (Steam/condensate piping located below enclosures shall be insulated).
- Piping unions for systems not requiring a vapor barrier

For systems with fluid temperatures 65° F or less, furnish and install removable elastomeric insulation covers, plugs or caps for all mechanical equipment and devices that require access by balancing contractors or service and maintenance personnel. Examples include but are not limited to: flow sensing devices, circuit setters, manual ball valve air vents, drain valves, blowdown valves, pressure/temperature test plugs, grease fittings, pump bearing caps, equipment labels, etc. Covers shall be tight fitting to ensure a complete vapor barrier.

DUCT INSULATION
GENERAL:
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.

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.

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.

Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.

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.

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.

Where insulated low temperature (below 45ºF) ductwork is supported by steel metal straps or wire ropes that are secured directly to the duct, the straps or ropes shall be completely covered with insulation and sealed to provide a complete vapor barrier.

Where insulated duct risers are supported by steel channels secured directly to the duct, extend the insulation and vapor barrier jacketing to encapsulate the support channels.

DUCT INSULATION SCHEDULE:
Provide duct insulation on new and existing remodeled ductwork in the following schedule:

Service	**Insulation Type**	**Jacket**	**Insulation Thickness**
Exposed supply ducts*	Rigid Fiberglass	FSJ	2"
Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"

* Exposed supply branch ducts located in the space they are serving do not require insulation. Exposed supply main ducts running through spaces they serve shall be insulated as exposed supply ducts scheduled above.

EQUIPMENT INSULATION SCHEDULE:
Provide equipment insulation as follows:

Equipment	**Insulation**	**Jacket**	**Thickness Type**
Reheat coil casing in exposed supply ducts	Rigid Fiberglass	FSJ	2"
Reheat coil casing in concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"

END OF SECTION

DDC INPUT / OUTPUT SUMMARY TABLE

PROJECT: Public Health Madison and Dane County Office Remodel 5/17/2018	HARDWARE																SOFTWARE																																
LOCATION: Madison, WI	OUTPUT								INPUT										ALARMS						ENERGY MANAGEMENT SYSTEM FUNCTIONS																									
	DIGITAL				ANALOG				DIGITAL						ANALOG						DIGITAL			ANALOG																												
Air Terminal Units POINT DESCRIPTION	Control Relay	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	Differential Pressure	Gauge Pressure	Static Pressure	Flow	Equipment Status	Maintenance	Pressure	High Limit	Low Limit			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 Integratio	Elect PQM Integration	Boiler Integeration	Dry-bulb Economizer	HW/OA Reset	OA Lockout	Smoke Control	Fire Alarm Override	Comments
AIR TERMINALS																																																
Zone Temperature															X									X	X									X													
Temperature Setpoint Adjust																																															Integral w/Sensor
Unnocupied Override Button											X																																				Integral w/Sensor
Occupancy Sensor												X																																			
Supply Air Damper [1 & 2]					X	X	X	X										X																													
Supply Air Flow																			X															X													
Discharge Air Temperature															X																			X													
Reheat Valve [1]					X	X	X	X																										X													
Perimeter Radiation Valve [1]					X	X	X	X																										X													

Notes:

1. Analog outputs must utilize a calculated proportional command from software. Actual output can be any type but floating outputs shall have feedback from the acutator so actual actuator position is known.
2. Damper actuators can utilize stepper type motors.

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

P A R T 1 - G E N E R A L

SCOPE

The existing building utilizes a Niagra direct digital control (DDC) system with Distech field devices. This project will add (22) new air terminal units and (23) sections of steam convector with DDC control that will be integrated into the existing building Niagra DDC system. This project shall provide:

- All new controllers required to integrate (22) new VAV air terminals into the existing building automation system.
- (22) new hot water reheat DDC temperature control valves for new VAV air terminals.
- (23) new steam DDC temperature control valves for existing steam convectors.
- (22) new space temperature sensors associated with each VAV air terminal.
- All control wiring (low and line voltage) for a complete operating system.
- Update of existing 5th floor City County Building automation graphics to include new air terminals, sensors, convectors, etc. associated with this project.

All new air terminals and air terminal controls shall be integrated into the Niagra DDC system.

All new controllers, control wiring and temperature control valves shall follow current City County Building protocols to provide building continuity in regards to controllers, wiring and equipment.

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.

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Material Delivery and Storage

PART 2 - PRODUCTS
- General
- Control Valves
- Thermostats

PART 3 - EXECUTION
- General
- Installation
- Sequence of Operation
- Owner Training
- Points List

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio Communication Interference

QUALITY ASSURANCE

APPROVED MANUFACTURER:
Niagra.

INSTALLER:
The installer shall be specialized and experienced in Niagra DDC control systems and installation for not less than 5 years. All engineering work shall be done by qualified employees of Niagra, or qualified employees of an Niagra Authorized Representative that provides engineering and commissioning of Alerton control equipment. Where installing contractor is an authorized representative of Niagra, submit written confirmation of such authorization. Indicate in letter of authorization that the installing contractor has successfully completed all necessary training required for the engineering, installation, and commissioning of equipment and systems to be provided for the project and that such authorization has been in effect for a period of not less than three years. The letter of authorization should also indicate that the installing contractor is authorized to install Niagra DDC equipment at the project location at the time the project is bid. Installation of the equipment shall be done by qualified mechanics and/or electricians in the direct employ or be directly subcontracted and under the supervision of Niagra or Authorized Niagra Representative. The contractor providing and installing the equipment under this specification section shall be the same contractor providing and installing equipment under the 23 09 14 specification section.

RESPONSE TIME:
During warrantee period, three (3) hours or less, 24-hours/day, 7 days/week.

ELECTRICAL STANDARDS:
Provide electrical products, which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

DDC Standards: DDC manufacturer shall provide written proof with shop drawings that the equipment being provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (Part 15, Subpart J, Class A).

SUBMITTALS
Provide submittals on all DDC control work.

Details of construction, layout, and location of each temperature control panel within the building, including instruments location in panel and labeling. Indicate which piece of mechanical equipment is associated with each controller and what area within the building is being served by that equipment. For terminal unit control, provide a room schedule that would list mechanical equipment tag, room number of space served, address of DDC controller, and any other pertinent information required for service.

A complete description of each control sequence for equipment that is not controlled by direct digital controls. Direct digital controlled equipment control sequences will be provided by the DDC control contractor.

PRODUCT DATA
Submit manufacturer's specifications for each control device furnished, including installation instructions and startup instructions. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked. Annotated software program documentation shall be submitted for system sequences, along with descriptive narratives of the sequence of operation of the entire system involved. Submit wiring diagram for each electrical control device along with other details required to demonstrate that the system has been coordinated and will function as a system.

MAINTENANCE DATA
Submit maintenance data and spare parts lists for each control device. Include this data in maintenance manual.
RECORD DRAWINGS
Provide as-built record control drawings, including sequences, for the installation of all DDC controls.

OPERATION AND MAINTENANCE DATA
All operations and maintenance data shall comply with the submission and content requirements specified under Section 23 05 00 and Division 1, General Requirements, Closeout Procedures.

MATERIAL DELIVERY AND STORAGE
Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

GENERAL

Provide DDC control and actuation to accomplish Sequence of Operation (indicated below) and DDC Points list. Provide all controllers, temperature control panels, wiring, etc. for a complete installation.

Controls installed as part of this project shall be fully compatible with existing DDC controls located within the facility.

Provide updated DDC/BAS graphics reflecting new work and sequences of control.

Provide all required installation, termination, wiring, power, graphics and programming for a complete operating system.

CONTROL VALVES

Manufacturer: Belimo (Valve and Actuator) only.

Provide all control valves as shown on the plans/details and as required to perform functions specified. Spring ranges must be selected to prevent overlap of operation and simultaneous heating and cooling.

Size operators to allow smooth and positive operation of devices served and to provide sufficient torque capacity for tight shutoff against system temperatures and pressure encountered. Use fully proportional actuators with 0-10VDC inputs and zero and span adjustments unless specified otherwise. If TriState with feedback is specified, valve position shall be fed back to the controller and controller shall position valve based on this feedback. Electric actuators, for applications other than terminal units, shall be provided with a manual override capability. All electric actuators shall be provided with a visible position indicator.

All power required for electric actuation shall be provided by this contractor if it is not able to be directly provided from the DDC controller.

Provide operators that are full proportioning or two-position, as required for specified sequence of operation.

Provide operators with linkages and brackets for mounting on device served.

All valves unless specifically noted on the plans or indicated below shall be ball style valves.

VALVE SERVING	TYPE	SIGNAL	SPRING RETURN	FAIL POSITION
Reheat Coil	Ball	0-10 VDC	No	Last Position
Perimeter Radiation	Valve - Belimo – B215HT186 (1/2”, Cv=1.86) Actuator – Belimo – TR24-SR US			

Use equal percentage valves for two-way control valves; size for a pressure drop not less than 4 psi or more than 6 psi. Note: For low flows, the required minimum Cv size will result in lower pressure drop than 4 psi.

Globe valves 2" and smaller: Cast bronze or forged brass body, brass plug and brass or stainless steel seat, stainless steel stem, screwed ends, suitable for use on water systems at 150 psig and 240° F. Seat leakage with actuator supplied will meet ANSI class IV leakage (0.01%). For globe valves that are specified to fail in place, valves shall be open when the stem is up. Only the following globe valve body styles will be acceptable for terminal unit control. Valves and actuators shall be by Belimo.

THERMOSTATS

Thermostats shall match existing thermostat functionality located in adjacent areas of the City County Building.

PART 3 - EXECUTION

GENERAL

All electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this contractor.

This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and certificates required to install a complete Direct Digital Control system as herein specified.

This Direct Digital Control system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and checkout necessary for a fully operational system.

INSTALLATION

All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All material shall be UL approved.

Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.

Any line voltage wiring to be by this contractor.

Label all control devices with the exception of dampers, valves, and terminal unit devices with permanent printed labels that correspond to control drawings. Temperature control junction and pullboxes shall be identified utilizing spray painted green covers. Other electrical system identification shall follow the 26 05 53 specification.

All control devices and electrical boxes mounted on insulated ductwork shall be mounted over the insulation. Provide mounting stand-offs where necessary for adequate support. Cutting and removal of insulation to mount devices directly on ductwork is not acceptable. This contractor shall coordinate with the insulation contractor to provide for continuous insulation of ductwork.

Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all high voltage and low voltage wiring (includes low voltage cable) in rigid metal conduit. All conduit must be installed in accordance with electrical sections (Division 26) of this specification and the National Electrical code.

Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.

Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded.

Low voltage wiring can be run without conduit above accessible lay-in tile ceilings. All wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other locations should be in conduit. Wire for wall sensors must be run in conduit. Wiring for radiation valves shall be run in conduit where routed through walls.

Where wiring is installed free-air, installation shall consider the following:

- Wiring shall utilize the cable tray wherever possible.
- Wiring shall run at right angles and be kept clear of other trades work.
- Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung without being threaded through the ring. For mounting rings that do not completely surround the wire, attach the wire to the mounting ring with a strap.
- Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
- Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
- Wall penetrations shall be sleeved.

Wiring shall not be attached to existing cabling, existing tubing, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.

Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.

Provide all necessary routers and or repeaters to accomplish connection to the BAN via the panel-mounted port provided.

All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labelled as "Spare".

Provide technician to work with air balancing contractor and/or provide balancing contractor with necessary hardware to over-ride DDC controllers for air balancing.

Provide documentation to demonstrate that all points, input and output, have been checked out and verified operational, note any points not operating properly with notation of reason.

SEQUENCE OF OPERATION

VARIABLE AIR VOLUME TERMINALS WITH HOT WATER REHEAT

Systems consist of:

- Variable air volume terminal
- Hot water reheat coil with 2-way temperature control valve.
- DDC space sensor.
- Lighting Occupancy Sensor

Provide all line and low voltage wiring for a complete operating system.

Provide a DDC space temperature sensor to control, in sequence, a modulating electronic control valve for the hot water reheat coil and actuator for terminal air flow. When space temperature is below setpoint, the air terminal damper shall modulate toward the cooling minimum flow position. After the air terminal damper is at its minimum flow, the hot water valve shall modulate open to maintain space temperature. If the air terminal has a heating airflow, the hot water control valve and air terminal shall open in parallel.

The reverse shall occur when space temperature is below setpoint. The heating coil valve shall be commanded closed whenever the associated AHU is off. Provide a discharge air temperature sensor for monitoring purposes.

Each space temperature sensor shall have a manual override button that shall index the space to the occupied mode for a period of two hours (adj.). If an occupancy sensor is specified, it shall index the terminal unit DDC controller to occupied mode for a minimum of 30 minutes (adj.).

Provide separate adjustable cooling and heating setpoints for both the occupied and unoccupied modes. When the space temperature is between the heating and cooling setpoints, the heating valve shall be closed and the airflow at heating and cooling minimum flow.

Occupancy sensors will be provided by the Division 26 contractor. Provide wiring from all occupancy sensor contacts to building automation system for space occupied/unoccupied control. When the occupancy sensor signals the zone is unoccupied, the minimum flow setpoint shall be zero CFM (adj.) and the heating and cooling temperature setpoints will be maintained at either the occupied or unoccupied heating and cooling setpoints as defined by the weekly schedule (grouped or individually). When the occupancy sensor signals the zone is occupied, the occupied minimum flow setpoint shall be as scheduled and the occupied heating and cooling temperature setpoints shall be maintained regardless of the weekly schedule. All programming for the above sequence shall reside in the terminal unit controller and a supervisory controller shall not be required to reset any flow or temperature setpoints based on the occupancy sensor.

Where there are multiple occupancy sensors associated with a VAV zone that serves multiple spaces, all occupancy sensors must be “unoccupied” for the air terminal to move to zero airflow setpoint.

VARIABLE AIR VOLUME TERMINALS WITH HOT WATER REHEAT AND PERIMETER STEAM RADIATION

Systems consist of:

- Variable air volume terminal
- Hot water reheat coil with 2-way temperature control valve.
- Existing steam convector(s) with new DDC control valve and actuator
- DDC discharge air sensor.
- DDC space sensor.

Provide all line and low voltage wiring for a complete operating system.

Mount discharge air temperature sensor a minimum of 3 duct diameters downstream of reheat coil.

Provide a DDC space temperature sensor to control, in sequence, a modulating electronic control valve for the hot water reheat coil and actuator for terminal air flow. When space temperature is below setpoint, the air terminal damper shall modulate toward the cooling minimum flow position. After the air terminal damper is at its minimum flow, the hot water reheat valve and perimeter steam radiation valve(s) shall modulate open in parallel to maintain space temperature.

Where multiple steam radiation convectors (each with a temperature control valve) are located within the same VAV zone, the convectors shall be controlled in unison.

The reverse shall occur when space temperature is below setpoint.

The heating coil valves shall be commanded closed whenever the associated AHU is off. Provide a discharge air temperature sensor for monitoring purposes.

Each space temperature sensor shall have a manual override button that shall index the space to the occupied mode for a period of two hours (adj.). If an occupancy sensor is specified, it shall index the terminal unit DDC controller to occupied mode for a minimum of 30 minutes (adj.).

Provide separate adjustable cooling and heating setpoints for both the occupied and unoccupied modes. When the space temperature is between the heating and cooling setpoints, the heating valve shall be closed and the airflow at heating and cooling minimum flow.

When the building is in the unoccupied mode and there is a call for heat in any perimeter zone, the perimeter steam radiation shall be used from setback heating. The VAV terminal heating coil control valve shall remain closed and air handler remain off.

Occupancy sensors will be provided by the Division 26 contractor. Provide wiring from all occupancy sensor contacts to building automation system for space occupied/unoccupied control. When the occupancy sensor signals the zone is unoccupied, the minimum flow setpoint shall be zero CFM (adj.) and the heating and cooling temperature setpoints will be maintained at either the occupied or unoccupied heating and cooling setpoints as defined by the weekly schedule (grouped or individually). When the occupancy sensor signals the zone is occupied, the occupied minimum flow setpoint shall be as scheduled and the occupied heating and cooling temperature setpoints shall be maintained regardless of the weekly schedule. All programming for the above sequence shall reside in the terminal unit controller and a supervisory controller shall not be required to reset any flow or temperature setpoints based on the occupancy sensor.

OWNER TRAINING

Provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 2 hours.

Provide two follow-up visits for troubleshooting and instruction, one six months after substantial completion and the other at the end of the warranty period. Length of each visit to be not less than 8 hours or the time necessary to provide required information and complete troubleshooting and inspection activity for all controls.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

P A R T 1 - G E N E R A L

SCOPE

This section contains specifications for all HVAC hydronic pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria

PART 2 - PRODUCTS
- Heating Hot Water
- Unions and Flanges
- Gaskets
- Unions and Flanges
- Mechanical Grooved Pipe Connections

PART 3 - EXECUTION
- Preparation
- Erection
- Threaded Pipe Joints
- Mechanical Grooved Pipe Connections
- Copper Pipe Joints
- Water Systems
- Unions and Flanges
- Gaskets
- Piping System Leak Tests
- Hydronic Piping System Flushing

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 15 - Piping Specialties
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation
Section 23 25 00 - HVAC Water Treatment.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A181	Forgings, Carbon Steel for General Purpose Piping
ASTM A197	Cupola Malleable Iron
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM B75	Seamless Copper Tube
ASTM B88	Seamless Copper Water Tube

SHOP DRAWINGS
Refer to Division 1, General Conditions, Submittals.

Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

TYPE F STEEL PIPE:
Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.

TYPE E OR S STEEL PIPE:
Mill certification papers, also known as material test reports, for the pipe furnished for this project, in English. Heat numbers on these papers to match the heat numbers stenciled on the pipe. Chemical analysis indicated on the mill certification papers to meet or exceed the requirements of the referenced ASTM specification.

COPPER TUBE:
Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.

QUALITY ASSURANCE
Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

DELIVERY, STORAGE, AND HANDLING
Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA
Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at Contractor's option.

P A R T 2 - P R O D U C T S

HEATING HOT WATER
2" and Smaller: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.

Contractor may use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for all sizes. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for branch takeoff up to one-half (1/2) the diameter of the main.

UNIONS AND FLANGES

2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use ANSI B16.18 cast copper alloy unions on copper piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

GASKETS

Water and Glycol Systems: Branded, compressed, non-asbestos sheet gaskets. Klingersil C4401, Garlock 3000, JM Clipper 978 or approved equal.

MECHANICAL GROOVED PIPE CONNECTIONS

Will not be allowed on this project.

P A R T 3 - E X E C U T I O N

ERECTION

Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be rejected and removed from the job site immediately. Excluding minor surface rust, piping that exhibits significant oxidation or corrosion will be rejected.

Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
Remove all lose dirt, scale, oil, chips, burrs and other foreign material from the internal and external surfaces of all pipe and piping components prior to assembly, including debris associated with cutting, threading and welding.

During fabrication and assembly, remove slag and weld spatter from internal pipe surfaces at all joints by peening, chipping and wire brushing.

During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item of the system. Use plugs, caps, blind flanges or other items designed for this purpose.

Furnish and install all flanges, caps, bypasses, drains, valves, etc. required to facilitate flushing and draining all heating and cooling system piping.

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

"Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

Install drains throughout the systems to permit complete drainage.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

Install all valves, control valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

THREADED PIPE JOINTS
Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

MECHANICAL GROOVED PIPE CONNECTIONS
Are not allowed on this project.

COPPER PIPE JOINTS
Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

Where mechanically formed tee fittings are allowed, form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Braze the joint, applying heat properly so that pipe and tee do not distort; remove distorted connections.

WATER SYSTEM
Run water mains level or pitch horizontal mains up 1 inch in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.

Main branches and runouts to terminal equipment may be made at the top, top 45 degree, side, and/or bottom 45 degree of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located at all top and top 45 degree connections. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.
Use top or top 45 degree connection to main for upfeed risers and bottom 45 degree connection to main for downfeed risers. Bottom connections are not acceptable.

Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

UNIONS AND FLANGES
Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

GASKETS
Store horizontally in cool, dry location and protect from sunlight, water and chemicals. Inspect flange surfaces for warping, radial scoring or heavy tool marks. Inspect fasteners, nuts and washers for burrs or cracks. Replace defective materials.

Align flanges parallel and perpendicular with bolt holes centered without using excessive force. Center gasket in opening. Lubricate fastener threads, nuts and washers with lubricant formulated for application.

Draw flanges together evenly to avoid pinching gasket. Tighten fasteners in cross pattern sequence (12 – 6 o'clock, 3 – 9 o'clock, etc.), one pass by hand and four passes by torque wrench at 30% full torque, 60% full torque and two passes at full torque per ASME B16.5.

PIPING SYSTEM LEAK TESTS
Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

Provide all piping, fittings, blind flanges, and equipment to perform the testing.

Conduct pressure test with test medium of air or water unless specifically indicated. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the A/E or an approved representative from the County. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

Do not insulate pipe until it has been successfully tested.

For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

System	Pressure	Medium	Duration
Heating hot water	100 psig	Water	8 hr

All pressure tests are to be documented.

On piping that cannot be tested because of connection to an active line, provide temporary blind flanges and hydrostatically test new section of piping. After completion of test, remove temporary flanges and make final connections to piping

HYDRONIC PIPING SYSTEM FLUSHING

All new heating hot water system piping shall be flushed thoroughly before the systems are put in to operation. Subsequent to executing the chemical cleaning processes specified in Section 23 25 00 – HVAC WATER TREATMENT, and prior to adding scale and corrosion inhibitors, flush all piping and components with a clean source of water until the discharge from the system is clean. Discharge shall be from drains provided at all low points in the piping, ends of headers and as otherwise necessary to flush and drain the entire system.

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: _____

_____

_____

PIPING SYSTEM FLUSHING REPORT (revised 10/1/2012)

Date Submitted: _____

Project Name:_____

Location:_____

Contractor:_____

System Identification (check one):

❒ **Chilled Water** ❒ **Process Chilled Water** ❒ **Heat Reclaim**

❒ **Heating Hot Water** ❒ **Other** _____

Describe procedure: _____

_____

_____

_____

Flush Date: _____ **Start Time:** _____ **Stop Time:** _____

Pressure of Water Source: _____ **PSIG Describe water source and method of connection to source :**
_____

_____

_____

PIPING SYSTEM FLUSHING REPORT (page 2)

Flushed By: _____ **Witnessed By:** _____

Title: _____ **Title:** _____

Company: _____ **Signed:** _____

Signed: _____ **Date:** _____

Date: _____

Describe results: _____

_____

_____

SECTION 232213
STEAM AND CONDENSATE HEATING PIPING

P A R T 1 - G E N E R A L

SCOPE

This section contains specifications for steam and condensate heating piping for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria

PART 2 - PRODUCTS
- Low Pressure Steam (15 psig and lower)
- Low Pressure Steam Condensate (Steam pressure 15 psig and lower)
- Unions and Flanges

PART 3 - EXECUTION
- Preparation
- Erection
- Threaded Pipe Joints
- Steam and Steam Condensate
- Unions and Flanges

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 15 - Piping Specialties
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A380	Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

QUALITY ASSURANCE

Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

DELIVERY, STORAGE, AND HANDLING
Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA
Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

Where weld fittings fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

P A R T 2 - P R O D U C T S

LOW PRESSURE STEAM (15 psig and lower)
2" and Smaller above grade in buildings: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.

LOW PRESSURE STEAM CONDENSATE (Steam pressure 15 psig and lower)
2" and Smaller above grade in buildings: ASTM A53, type F, extra strong (schedule 80) black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.

UNIONS AND FLANGES
2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use ANSI B16.18 cast copper alloy unions on copper piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

Provide ASTM A 193 B7 grade bolts and A 194 2H grade nuts & hardened washers for connections (Use star washers when required for grounding.)

P A R T 3 - E X E C U T I O N

PREPARATION
Remove all foreign material from interior and exterior of pipe and fittings.

ERECTION
Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

All pipe shall be installed with adequate space to fully insulate the pipe, minor alignment offsets to provide adequate spacing for the pipes shall have no additional cost to the project.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

"Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

Install all valves, control valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

THREADED PIPE JOINTS

Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

STEAM AND STEAM CONDENSATE

Pitch mains down 1 inch in 40 feet in the direction of flow. Pitch terminal equipment runouts down 1 inch in 2 feet for proper condensate drainage.

Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper condensate drainage. Concentric fittings may be used for changes in vertical pipe sizes.

Make branch connections and runouts at the top of the main or 45 degrees from the top. Condensate connections may be made in the horizontal plane in limited space situations.

Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping system. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

Install flanges, taps, vents and drains needed to fill, vent and drain the piping for hydrostatic testing.

UNIONS AND FLANGES

Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

END OF SECTION

SECTION 232500
HVAC WATER TREATMENT

P A R T 1 - G E N E R A L

SCOPE

This section includes specifications for chemical treatment of all new water piping. All new water piping, (branch and main piping) shall be cleaned. Included are the following topics:

PART 1 - GENERAL
- Scope
- Reference
- Related Work
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria
- Maintenance Service

PART 2 - PRODUCTS
- Manufacturers
- System Cleaner
- System Inhibitor
- Closed Water System Treatment

PART 3 - EXECUTION
- Preparation
- Cleaning Sequence
- Closed Water Systems

Appendix
- Pipe Cleaning and Treatment Report

REFERENCE

Applicable provisions of Division 1 shall govern work under this Section.

RELATED WORK

Section 23 05 15 - Piping Specialties

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Required for all equipment and chemicals specified including data concerning dimensions, capacities, materials of construction, weights, operating sequence, composite wiring diagrams and appropriate identification. Chemical data to include the description of the chemical, its composition, its function, and the associated material safety data sheet.

OPERATION AND MAINTENANCE DATA

Provide for the services of the manufacturer's trained representative to approve the installation and instruct the user agency in the operation of each system.

Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

DESIGN CRITERIA

This project will be responsible for flushing and cleaning of all new hot water piping in the areas of renovation only. The existing hot water heating loop currently has a chemical treatment system installed.

All chemicals used must be compatible with the existing chemical treatment system
Provide electrical devices, motors, wiring, pumps, etc. to provide system cleaning and flushout.

MAINTENANCE SERVICE
Not required. The County currently contracts for chemical treatment.

P A R T 2 - P R O D U C T S

MANUFACTURERS
Betz Entac, Dearborn Div. - W. R. Grace & Co., Fremont Industries, IWM, Mitco Water Labs, Mogul Corporation, Nalco Chemical Co., Western Water Management, or approved equal.

SYSTEM CLEANER
Blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors that remove grease and petroleum products from the interior of piping systems. Cleaners that contain trisodium phosphate are specifically not acceptable.

All chemicals used must be compatible with the existing chemical treatment system

SYSTEM INHIBITOR
Scale and corrosion inhibitor consisting of boron nitrite, benzol thiazol, benzotriazole, mercapto-benzo-thiazole, and tolyltrizole silicates.

All chemicals used must be compatible with the existing chemical treatment system

CLOSED WATER SYSTEM TREATMENT
Sequestering agent to reduce deposits and adjust pH: polyphosphate.

Corrosion inhibitors: boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

Conductivity enhancers: phosphates or phosphonates.

P A R T 3 - E X E C U T I O N

PREPARATION
Prior to cleaning, verify that systems are operational, filled, started, and vented. Use water meter to record capacity in each system.

Place terminal control valves in the full-open position

CLEANING SEQUENCE

GENERAL
Clean all new hot water mains and branch piping.

Systems are to be cleaned before they are used for any purpose except conduct pressure test before cleaning. Add cleaner to closed systems at concentrations as recommended by the manufacturer. Remove water filter elements from the system before starting circulation. For steam systems, fill boilers only, using the water and cleaner solution.

Use neutralizer agents on recommendation of the system cleaner supplier and approval of the Architect/Engineer.

Remove, clean, and replace strainer screens.

Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

HOT WATER HEATING SYSTEMS
Add cleaner to the system water until the M alkalinity value is 250 above that of the initial fill water. Verify the M alkalinity level before and after the addition of the cleaner by means of chemical tests that are observed by the Owner's construction representative; include results of all tests in the Operating and Maintenance manuals. Apply heat while circulating, slowly raising temperature to 160°F and maintain for 12 hours minimum; vent all high points to assure 100% system circulation. Remove heat and circulate to 100°F or less; drain system as quickly as possible and refill with clean water.

Circulate for 6 hours at design temperature, vent air at all high points, then drain. Refill with clean water and repeat until the system cleaner is removed and the M alkalinity level returns to normal. Remove and clean all strainers. Re-vent the system. Treat with scale and corrosion inhibitors before using the system for building heating or cooling.

CLOSED WATER CHEMICAL TREATMENT SYSTEM

The existing building chemical treatment system will be used for treating the existing, expanded hot water heating loop.

Prior to allowing the new hot water piping to be tied into the existing building hot water heating loop, all new piping must be pressure tested and cleaned as indicated above, with documentation (Pipe Cleaning and Treatment Report). Prior to allowing building hot water to circulate thru new piping and return back to the building, notify City County Building Facilities Personnel that the new piping connection is ready for use.

PIPE CLEANING AND TREATMENT REPORT

Date Submitted:_____

Project **Name:**_____
Location:_____
Contractor:_____

System Tested: **Hot Water**___ **Glycol Water**___ **Chilled Water**___ **Fuel Oil**____

System Volume:_____

Materials Used (Provide MSDS for each)

Cleaner:_____	**Quantity Used:**_____
Inhibitor:_____	**Quantity Used:**_____
Sequestering Agent:_____	**Quantity Used:**_____
Algaecide:_____	**Quantity Used:**_____
Neutralizer:_____	**Quantity Used:**_____

M Alkalinity
Prior to Cleaning:_____ **During Cleaning:**_____ **After Flushing:**_____

System Temperature
Prior to Cleaning:_____ **During Cleaning:**_____

Duration	**Date/Time Start**	**Date/Time Stop**
Initial Circulation	_____	_____
Draindown	_____	_____
System Refill	_____	_____
Final Circulation	_____	_____
Heating system Warmup	_____	_____

Component Checklist (Describe procedures performed at each)

Strainers:_____

Filters:_____

Vents:_____

Drains:_____

Traps:_____

Branch Lines:_____

Terminal Units:_____

AdditionalComments_____

END OF SECTION

SECTION 233100
HVAC DUCTS and CASINGS

P A R T 1 - G E N E R A L

SCOPE

This section includes specifications for all duct systems used on this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- General
- Ductwork Pressure Class
- Materials
- High Pressure Ductwork (Pressure class 3 inch and over)
- Low Pressure Ductwork (Maximum 2 inch pressure class)
- Duct Sealant
- Gaskets

PART 3 - EXECUTION
- Installation
- Ductwork Support
- High Pressure Duct (Pressure class 3 inch and over)
- Low Pressure Duct (Maximum 2 inch pressure class)
- Cleaning
- Leakage Test

APPENDIX
- Duct Leakage Test Report

RELATED WORK

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
Section 23 33 00 – Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A623	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A527	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM 924	Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
ASTM C 1071	Specification for Fibrous Glass Duct Lining Insulation
ASTM C 411	Test Method for Hot Surface Performance of High Temperature Thermal Insulation
ASTM E 84	Test Method for Surface Burning Characteristics of Building Materials
ASTM C 1338	Test Method for Determining Fungal Resistance of Insulation Materials and Facings
ASTM G 21	Standard Practice for Determining Resistance of Synthetic Polymeric Materials
ASTM C 916	Standard Specification for Adhesives for Duct Thermal Insulation NFPA 90A
	Standard for the Installation of Air Conditioning and Ventilating Systems
UL 181	Standard for Safety for Factory Made Air Ducts and Air Connectors.
NAIMA	Fibrous Glass Duct Liner Standard

QUALITY ASSURANCE
Refer to Division 1, General Conditions, Product Substitution Procedures.

SHOP DRAWINGS
Refer to Division 1, General Conditions, Submittals.

Include manufacturer's data and/or Contractor data for the following:

- Schedule of duct systems including material of construction, gauge, pressure class, system class, method of reinforcement, joint construction, fitting construction, and support methods, all with details as appropriate.
- Duct sealant and gasket material.
- Duct liner including data on thermal conductivity, air friction correction factor, and limitation on temperature and velocity.

DESIGN CRITERIA
Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:

- HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
- HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
- HVAC Systems - Duct Design, 4th Edition, 2006
- Rectangular Industrial Duct Construction Standard, 2nd Edition, 2004
- Round Industrial Duct Construction Standards, 2nd Edition, 1999

Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

DELIVERY, STORAGE AND HANDLING
Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.

Protect Ductwork against damage.

Protect Ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.

Offsite storage agreements do not relieve the contractor from using proper storage techniques.
Storage and protection methods must allow inspection to verify products.

P A R T 2 - P R O D U C T S

GENERAL
All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork and spiral duct take-offs 12” and below may be 26 gauge where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005.

Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

DUCTWORK PRESSURE CLASS
Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2 inch W.G. positive or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1 inch W.G. positive or negative, depending on the application. Duct system pressure classes not indicated on the drawings to be as follows:

Supply duct upstream of VAV boxes	4 in. pressure class
Supply duct downstream of VAV terminals	2 in. pressure class
Transfer ducts	2 in. pressure class
Return ducts	3 in. pressure class

MATERIALS

GALVANIZED STEEL SHEET:
Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide "Paint Grip" finish or galvanneal sheetmetal for ductwork that will be painted.

HIGH PRESSURE DUCTWORK (Pressure class 3 inch and over)
Manufacturers: Ajax, Semco, United Sheet Metal, Sheet Metal Connectors or approved equal.

Machine formed round and/or flat oval spiral lock seam duct constructed of galvanized steel.

Rectangular high pressure duct using a transverse joint system as manufactured by Ductmate, Nexus, TDC, TDF, or approved equal, may be used at contractor's option. Duct to be flanged, gasketed and sealed.

Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.

Use a perforated inner liner on double wall high-pressure duct. Annular space between inner liner and outer duct to be filled with 1 inch glass fiber insulation.
Use cemented slip joints with 2 inch minimum overlap, flanged connections, or welded/brazed connections, unless noted otherwise for special applications. Prime coat welded joints.

Provide standard 90 degree conical tee takeoffs except for exhaust at velocities over 2000 feet per minute, use 45° lateral connections; straight taps or bullhead tees are not acceptable.

Internal bracing will not be accepted on ductwork below 48 inches.

Use turning vanes as specified in Section 23 33 12.

Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.

Provide pressure relief fittings as indicated on the plans and/or details.

Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

LOW PRESSURE DUCTWORK (Maximum 2 inch pressure class)
Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.

Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction when fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2 inch into the duct.

Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits. When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in accordance with SMACNA publications, Type RE 3. Where space will not allow and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows will not be acceptable. Straight taps or bullhead tees are not acceptable.

Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.

Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be accepted.

Button punch snaplock construction will not be accepted on aluminum ductwork.

Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer.

Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

DUCT SEALANT

Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peal & Seal, Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in any type of ductwork installation.

Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

GASKETS

2 INCH PRESSURE CLASS AND LOWER:
Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.

3 INCH PRESSURE CLASS AND HIGHER:
Butyl gaskets.

P A R T 3 - E X E C U T I O N

INSTALLATION

On 5th floor, new ductwork will be tied into existing fiberglass duct board. Contractor to make provisions for connection of new duct to existing duct.

Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference.

Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or fume exhaust ductwork.

Test openings for test and balance work will be provided under Section 23 05 93.

Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.

Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.

Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

Provide adequate access to ductwork for cleaning purposes.

Provide temporary capping of ductwork openings to prevent entry of dirt, dust and foreign material.

Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the Ductwork.

During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

DUCTWORK SUPPORT

Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5-5, except supporting ductwork with secure wire method is not allowed.
Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching fastener rated for 50% of actual load, will be allowed on round ductwork under 12 inches if installed as detailed, with cable double looped on duct and at point of support.

HIGH PRESSURE DUCT (Pressure class 3 inch and over)
Seal all duct in accordance with SMACNA seal class "A"; all seams, joints, and penetrations shall be sealed.

See plans for locations of single wall and double wall high pressure ductwork.

LOW PRESSURE DUCT (Maximum 2 inch pressure class)
Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal class "A"; all seams, joints, and penetrations shall be sealed.
Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers will not be accepted for balancing dampers.

Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at contractor's option.

CLEANING
Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.

Clean duct systems with high power vacuum machines where systems have been used for temporary heat, air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

LEAKAGE TEST
Leakage testing will not be required, unless the owner or A/E observes excessive leakage from ductwork, or test and balancing reports indicate duct leakage.

END OF SECTION

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SECTION 233300
AIR DUCT ACCESSORIES

P A R T 1 - G E N E R A L

SCOPE

This sections includes accessories used in the installation of duct systems. Included are the following topics:

PART 1 - GENERAL
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data

PART 2 - PRODUCTS
- Manual Volume Dampers
- Turning Vanes
- Access Doors
- Flexible Duct
- Duct Lining

PART 3 - EXECUTION
- Manual Volume Dampers
- Turning Vanes
- Access Doors
- Flexible Duct
- Duct Lining

RELATED WORK

Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment
Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
Section 23 31 00 – HVAC Ducts and Casings

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition, 1995
UL 214
UL 555 (6^{th} edition) Standard for Fire Dampers and Ceiling Dampers

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.
Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance of sound attenuators.

Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under Section 23 05 00 and Division 1, General Requirements, Closeout Procedures.

PART 2 - PRODUCTS

MANUAL VOLUME DAMPERS
Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.

Dampers must be constructed in accordance with SMACNA Fig. 2-12, Fig. 2-13, and notes relating to these figures, except as modified below.

Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

TURNING VANES
Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.

Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Fig. 2-5 and Fig. 2-6.

ACCESS DOORS
Access door to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be aluminum or steel full length continuous piano type. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non-hinged doors provide sufficient number of camp sash latches to provide air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1” deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1” deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

Use insulated, 1-1/2 hour UL 1978 listed and labeled access doors in kitchen exhaust ducts.

FLEXIBLE DUCT
Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster or approved equal.

Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under in accordance with NFPA 90A.

Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ±2 inch pressure class, depending on the application.

Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.

Where duct is specified to be insulated, provide a minimum 1 inch fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

DUCT LINING
Manufacturer: Manville, Owens-Corning, Knauf, or approved equal.

1 inch thick, flexible, mat faced insulation made from inorganic glass fibers bonded with a thermosetting resin with thermal conductivity of .25 Btu inch / hour sq.ft. deg F.
Meet erosion testing per UL 181 or ASTM C 1071 for 5000 fpm maximum air velocity. ASTM C 411 maximum operating temperature rating of 250 deg F. ASTM E84 flame spread less than 25 and smoke developed less than 50.

Meet requirements of ASTM C 1338 and ASTM G21 for fungi resistance.
Install liner using adhesive conforming to ASTM C 916.

PART 3 - EXECUTION

MANUAL VOLUME DAMPERS

Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

TURNING VANES

Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and/or manufacturer's recommendations.

Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.

If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and Figure 2-6.

ACCESS DOORS

Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and control devices needing periodic maintenance.

Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils.

Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, “SMOKE DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

FLEXIBLE DUCT

Flexible duct may only be used for final connections of air inlets and outlets at diffuser, register, and grille locations. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than 5 feet in length, and have no more than one (1) 90 degree bend.

Secure inner jacket of flexible duct in place with stainless steel metal band clamp. Secure insulation vapor barrier jacket in place with steel or nylon draw band. Sheetmetal screws and/or duct tape will not be accepted.

Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.

Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will not be accepted.

Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.

Penetration of any partition, wall, or floor with flexible duct will not be accepted.

DUCT LINING

Only apply lining to the following ductwork:

- Transfer Air Ducts.
- Return Air Ducts (as noted on drawings).

Install liner in compliance with the latest edition of NAIMA’s Fibrous Glass Duct Liner Standard. Locate longitudinal joints at the corners of duct only. Cut and fit to assure lapped, compressed joints. Coat all transverse and longitudinal joints and edges with adhesive. Provide metal nosing on leading edge where lined duct is preceded by unlined duct. Adhere liner to duct with full coverage area of adhesive. Additionally, secure liner to duct using

mechanical fasteners spaced as recommended by the liner manufacturer without compressing liner more than 1/8" with the fasteners.

END OF SECTION

SECTION 233600
AIR TERMINAL UNITS

PART 1 - GENERAL

SCOPE

This section includes specifications for air terminal equipment. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS
- Supply Air Terminal Boxes
- Access Doors
- Insulation

PART 3 - EXECUTION
- Installation
- Reheat Coils
- Access Doors
- Insulation
- Adjusting

RELATED WORK

Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC
Section 23 09 93 – Sequence of Operation for HVAC Controls
Section 23 31 00 - HVAC Ducts and Casings
Section 23 33 00 - Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
UL 181 - Factory-Made Air Ducts and Connectors.
ARI-ADC Standard 880
ASTM E84 – Surface Burning Characteristics of Building Materials
UL 723 – Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Product Substitution Procedures.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

Contractor shall submit air terminal unit data including materials of construction, dimensions, scheduled flow rates, pressure drops, radiated and discharge sound power levels, reset volume controller data, actuator spring range and torque data.

OPERATION AND MAINTENANCE DATA
All operations and maintenance data shall comply with the submission and content requirements specified under Section 23 05 00 and Division 1, General Requirements, Closeout Procedures.

DESIGN CRITERIA
Select sizes, capacities, configuration, and operating characteristics as shown on the plans and/or as scheduled.

PART 2 - PRODUCTS

SUPPLY AIR TERMINAL BOXES
Units shall be single duct and pressure independent.

MANUFACTURERS:
Nailor is the basis of design. Units by Price and Titus are acceptable.

CONSTRUCTION:
Unit casing shall be minimum 22 gauge steel and internally insulated with 13/16" rigid fiberglass insulation with a foil scrim face or ¾" thick polyolefin closed cell insulation. Construction to meet UL 181 and NFPA 90A. Casing shall be sealed to limit leakage to a maximum of 15 cfm at 6.0 inches of static pressure. Casing outlet shall have slip and drive joint for connection to discharge ductwork.

16 gauge metal opposed blade damper shall be mounted to shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against gasket to limit leakage to 10 cfm at 6.0 inches of differential static pressure and be equipped with fitted and flexible seals Damper blades shall be screwed thru the shaft and include acetal copolymer bearings. Damper linkage shall be sized to accept at least 40 inch-pounds of torque to the damper shaft. Damper shaft shall be provided with a marking indicating damper position.

Round inlet collar shall be equipped with a multi-point flow sensor that shall amplify the measured velocity pressure. Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type.

Provide factory access door in bottom on unit.

HOT WATER REHEAT COIL**:**
Construct coils of copper tubes and aluminum fins in a serpentine arrangement with piping connections on the same end. Provide galvanized steel casing, end supports, top and bottom channels to allowance for expansion of finned tube section. Factory test coils at 200 psig.

Headers may be cast iron with tubes expanded into the header, steel pipe with tubes brazed to the header, or seamless copper with tubes brazed to the header.

Frames to be flanged for a gasketed connection to adjacent ductwork or constructed for slip and drive connection to the ductwork.

Minimum reheat coil size is 8 inches x 8 inches.

ACCESS DOORS

STANDARD ACCESS DOORS:
Access door to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be steel full length continuous piano type. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non hinged doors provide sufficient number of camp sash latches to provide air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1" deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

ROUND DUCT ACCESS DOORS:
For duct pressure class positive or negative up to 6 in. wg. Access doors shall be constructed from 16 gauge stainless steel for fume exhaust ducts and 16 gauge galvanized steel for general exhaust or return ducts. Hinges shall be continuous piano style constructed from the same material as the access door. Access doors shall be sealed with ¼" closed cell butyl gasketing permanently bonded on all four sides and no fewer than two draw latches with strike plates. The strike plates shall match the duct/access door material.

For duct pressure class positive or negative up to 10 in. wg. Access doors shall be the sandwich type and constructed from two layers of stamped 22 gauge stainless steel for fume exhaust ducts and 22 gauge galvanized steel for general or return ducts. Access doors shall be sealed with ¼" butyl gasketing permanently bonded to all four sides of the inside door. The bolts and springs shall be constructed from the same material as the access door. The knobs shall be constructed from polypropylene with threaded metal inserts and able to be fastened without the use of wrenches.

INSULATION
Materials or accessories containing asbestos will not be accepted.

Use composite insulation systems (insulation, jackets, sealants, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less.

The following two internal insulation options may be utilized.

RIGID FIBERGLASS INSULATION:
Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of .02 perms. All exposed insulation edges shall be covered with metal nosing.

POLYOLEFIN INSULATION:
Flexible closed cell, minimum nominal density of 1.5 lbs. per cu. ft., thermal conductivity of not more than 0.24 at 75 degrees F, minimum compressive strength of 5 psi at 25% deformation, maximum water vapor permeability of 0.0 perm inch, maximum water absorption of 0% by weight and volume, rated for service range of -165 degrees F to 210 degrees F.

PART 3 - EXECUTION

INSTALLATION
Install air terminal units as indicated on project drawings and in accordance with the manufacturer's installation instructions.

Mount air terminal boxes with a minimum 3 feet of straight ductwork upstream of inlet flow sensor for sizes 12" diameter and below. Provide a minimum of 3X the inlet diameter of straight duct upstream of the inlet flow sensor for inlet sizes above 12" diameter.

Where hot water reheat coils are provided with air terminal boxes the following two options may be used.

Field mount coil separate from box with a 12-18" section of duct between the air terminal box and reheat coil. The reheat coil and 12-18" section of duct shall be wrapped with external insulation as indicated in specification section 23 07 00 – HVAC Insulation.

Factory mount coil in extended supply air terminal unit. The supply air terminal unit shall be extended at the factory 12-18" and internally insulated to match the insulation used for the supply air terminal unit

Provide at least 24" of clearance on controller side of the air terminal unit. The clearance area shall extend the full length of the supply air terminal unit and the full length (including the access door) of the exhaust/return air terminal unit

Support air terminal units from building structure using sheet metal straps or trapeze hanger with rods. Do not mount air terminal units off of adjacent ductwork or piping.

REHEAT COILS

Comb bent or crushed fins and clean dust and debris from each coil before enclosing coils in ductwork. Pitch coil casings in accordance with manufacturer's instructions. Install a drain valve on the coil side of the shutoff valves for each reheat coil.

Pipe coils with multiple rows for counter flow arrangement.

ACCESS DOORS

DUCT ACCESS DOORS – SQUARE DUCT:

Provide duct access doors in duct or extended supply air terminal unit upstream and downstream of the reheat coil. Duct access doors shall be as large as duct allows with a maximum size of 18”x18”. Install heating coils in accordance with Section 23 73 12 - Air Handling Unit Coils.

DUCT ACCESS DOORS – ROUND DUCT:

Install round duct access doors on the side of the duct upstream of the return/exhaust terminal unit. At no time shall the access door be installed in the bottom of the duct. Piano hinged style access doors shall be installed with the piano hinges located ½ above the bottom of the duct to allow the access door to swing down toward the floor.

INSULATION

RIGID FIBERGLASS INSULATION:

All rigid duct insulation edges shall be covered with metal nosing. Foil scrim face must completely separate the rigid fiberglass duct material from the air stream.

POLYOLEFIN INSULATION:

Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.

ADJUSTING

Coordinate adjustment of air terminal units with section 23 05 93 - Testing, Adjusting and Balancing.

END OF SECTION

SECTION 233713
DIFFUSERS, REGISTERS & GRILLES

PART 1 - GENERAL

SCOPE

This section includes specifications for air terminal equipment. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Submittals
- Design Criteria

PART 2 - PRODUCTS
- Manufacturers
- Square Ceiling Diffusers - Plaque
- Eggcrate Grille

PART 3 - EXECUTION
- Installation

RELATED WORK

Section 23 31 00 - HVAC Ducts and Casings
Section 23 33 00 - Air Duct Accessories
Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
UL 181 - Factory-Made Air Ducts and Connectors.
ARI-ADC Standard 880

QUALITY ASSURANCE

Refer to division 1, General Conditions, Product Substitution Procedures.

SUBMITTALS

Refer to Dvision 1, General Conditions, Submittals.

Furnish submittal information including, but not limited to, the following:
- Manufacturer's name and model number
- Identification as referenced in the documents
- Capacities/ratings
- Materials of construction
- Sound ratings
- Dimensions
- Finish
- Color selection charts where applicable
- Manufacturer's installation instructions
- All other appropriate data

DESIGN CRITERIA

All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test Code 1062 GRD 84.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price, and United Sheet Metal.

Acceptable manufacturers for specific products are listed under each item.

SQUARE CEILING DIFFUSERS - Plaque

Titus model OMNI, Carnes series SFPA/SHPA, Price model ASPD, Metal Aire series 5750, and Krueger series PLQ/5PLQ.

Aluminum (Steel) unless otherwise indicated, louvered face furnished with frame type appropriate to installation.

Directional blow pattern as shown on the drawings and/or as scheduled.

One-piece removable square face plaque with one-piece backpan.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

PART 3 - EXECUTION

INSTALLATION

Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.

Furnish diffusers with equalizing grids where it is not possible to maintain minimum 2 duct diameter straight duct into diffuser. Equalizing grids shall consist of individually adjustable vanes designed for equalizing airflow into diffuser neck and providing directional control of airflow.

Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.

Seal connections between ductwork drops and diffusers/grilles airtight.

Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

END OF SECTION

SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

The electrical work included in all other divisions is the responsibility of the contractor performing the division 26 work unless noted otherwise.

PROJECT OVERVIEW

The project consists of a renovation of the Fifth Floor of the Public Health Madison & Dane County office building space in Madison, Wisconsin. The project areas will be entirely renovated with new lighting, power, fire alarm, and communications. The existing electrical panels in the area will remain and will be reused to feed the new/revised loads in the project.

SCOPE

The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections. 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:

PART 1 - GENERAL
- Project Overview
- Scope
- Related Work
- Reference Standards
- Regulatory Requirements
- Quality Assurance
- Continuity of Existing Services and Systems
- Protection of Finished Surfaces
- Approved Electrical Testing Laboratories
- Sleeves and Openings
- Sealing and Fire Stopping
- Intent
- Omissions
- Submittals
- Project/Site Conditions
- Work Sequence and Scheduling
- Work by Other Trades
- Salvage Materials
- Certificates and Inspections
- Operating and Maintenance Data
- Record Drawings

PART 2 - PRODUCTS
- Access Panels and Doors
- Identification
- Sealing and Fire Stopping

PART 3 - EXECUTION
- Paintability
- Concrete Work
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Sleeves and Openings
- Sealing and Fire Stopping
- Housekeeping and Clean Up

Agency Training

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
ISA	Instrument Society of America
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
UL	Underwriters Laboratories Inc.
DSPS	Wisconsin Department of Safety and Professional Services

REGULATORY REQUIREMENTS

All work and materials are to conform in every detail to applicable rules and requirements of the Wisconsin State Electrical Code (SPS 316), the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

All Division 26 work shall be done under the direction of a currently licensed State of Wisconsin Master Electrician.

QUALITY ASSURANCE

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space, and for obtaining the performance from the system into which these items are placed.

Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by City of Madison, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.

CONTINUITY OF EXISTING SERVICES AND SYSTEMS

No outages shall be permitted on existing systems except at the time and during the interval specified by the user agency and by the City of Madison Project Representative. The institution may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven-day week schedule.

PROTECTION OF FINISHED SURFACES

Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

APPROVED ELECTRICAL TESTING LABORATORIES

The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:

Underwriters Laboratories Inc.
Electrical Testing Laboratories, Inc.

SLEEVES AND OPENINGS

Refer to Division 1, General Requirements, Sleeves and Openings.

SEALING AND FIRE STOPPING

Sealing and fire stopping of sleeves/openings between conduits, cable trays, wireways, troughs, cablebus, busduct, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

INTENT

The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the City's intent (as determined by the City of Madison Project Manager). Refer to the General Conditions of the Contract for further clarification.

It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

All sizes as given are minimum except as noted.

Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the City of Madison's and/or A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.

Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

OMISSIONS

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

SUBMITTALS

Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

On request from the City of Madison, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.

Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

The submittals must be approved before fabrication is authorized.
Submit sufficient quantities of submittals to allow the following distribution:

Operating and Maintenance Manuals	2 copies
User agency	1 copy
A/E	1 copy

PROJECT/SITE CONDITIONS

Install Work in locations shown on drawings, unless prevented by project conditions.

Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of City of Madison before proceeding.

Tools, materials and equipment shall be confined to areas designated by the City of Madison.

WORK SEQUENCE AND SCHEDULING

Install work in phases to accommodate user agency's occupancy requirements. During the construction period coordinate electrical schedule and operations with City of Madison's Construction Representative.

WORK BY OTHER TRADES

Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.

Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

SALVAGE MATERIALS

No materials removed from this project shall be reused unless specifically noted otherwise. All materials removed shall become the property of and shall be disposed of by the Contractor.

CERTIFICATES AND INSPECTIONS

Obtain and pay for all required installation inspections.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. Manufacturer’s wiring diagrams for electrically powered equipment.

RECORD DRAWINGS

The Contractor shall maintain at least one copy each of the specifications and drawings on the job site at all times.

The City of Madison will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.

At completion of the project, the Contractor shall submit the marked-up record drawings to the Architect/Engineer prior to final payment.

PART 2 - PRODUCTS

ACCESS PANELS AND DOORS

Lay-in Ceilings:

Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under other divisions are sufficient; no additional access provisions are required unless specifically indicated.

IDENTIFICATION

See Electrical section 26 05 53 – Identification for Electrical Systems.

SEALING AND FIRE STOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 “Fire Stopping”.

NON-RATED PENETRATIONS:

Conduit and Cable Tray Penetrations:

At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 - EXECUTION

PAINTABILITY

Any/all electrical equipment, conduit, wiring, boxes, etc. that is to be exposed shall be painted to match the architectural colors throughout the construction limits. Provide the appropriate finish on all electrical equipment, conduit, wiring, boxes, etc. such that painting is possible. Coordinate all finish requirements with architectural documents.

CONCRETE WORK

The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

CUTTING AND PATCHING

Refer to Division 1, General Requirements, Cutting and Patching.

BUILDING ACCESS

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

EQUIPMENT ACCESS

Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

COORDINATION

The Contractor shall cooperate with other trades and City of Madison in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the City of Madison, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

SLEEVES AND OPENINGS

Conduit penetrations in existing concrete floors: Core drill openings.

Where penetrating conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

SEALING AND FIRE STOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

NON-RATED PENETRATIONS:

At all interior walls and exterior walls, conduit penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve or cored opening and the conduit is completely blocked.

PENETRATIONS SUBJECT TO WATER INTRUSION:

For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:

- Conduit penetration where steel pipe sleeve is used extend steel sleeve 2” above the floor.
- Conduit penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2” above the floor (provided it meets the device’s UL listing).
- Conduit penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2”x 2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8”on center. Seal corners water tight with urethane caulk.

Floors subject to water intrusion or rooms housing electrical equipment include the following locations:

- Restrooms
- Janitor Rooms w/ Sinks
- Mechanical/Plumbing Equipment Rooms
- Data/Telecommunications Rooms
- Electrical Equipment Rooms

Provide waterproof caulk sealant top coating on fire stopping system (or other approved means to protect the fire stopping system from water) in areas subject to wash down such as Food Service and Dish Washing Areas.

HOUSEKEEPING AND CLEAN UP

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

AGENCY TRAINING

Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 4 hours.

END OF SECTION

SECTION 260502
ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

SCOPE

The work under this section includes the demolition associated with the renovation of the Fifth Floor of the Public Health Madison & Dane County office building space in Madison, Wisconsin. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work

PART 2 - PRODUCTS
- Materials and Equipment

PART 3 - EXECUTION
- Examination
- Preparation
- Demolition and Extension of the Existing Electrical Work

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

MATERIALS AND EQUIPMENT

Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 - EXECUTION

EXAMINATION

Verify field measurements and circuiting arrangements as shown on Drawings.

Verify that abandoned wiring and equipment serve only abandoned facilities.

Demolition Drawings are based on casual field observation and/or existing record documents. Report discrepancies to the User Agency, Architect/Engineer and City of Madison Field Representative before disturbing existing installation.

Beginning of demolition means installer accepts existing conditions.

PREPARATION

Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

Coordinate utility service outages with the User Agency, City of Madison Field Representative, and Architect/Engineer. Also, if applicable, coordinate utility service outages with the local Utility Company.

Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations and follow the safe working practice requirements of NFPA 70E.

Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the City of Madison Field Representative at least 48 hours before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area.

Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Obtain permission from the City of Madison Field Representative and local Authority Having Jurisdiction at least 48 hours before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area.

Existing Communication/Data System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the City of Madison Field Representative and local Telephone Utility. If required, make temporary connections to maintain service in areas adjacent to work area.

DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

Remove, relocate, and extend existing installations as necessary, to accommodate new construction and to meet all requirements of these specifications. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

Remove abandoned wiring to source of supply.

Remove exposed abandoned conduit and abandoned conduit above accessible ceiling finishes, unless noted otherwise on drawings. Cut conduit flush with walls and floors, and patch surfaces. If certain conduits and boxes are abandoned but not scheduled for removal, they shall be shown on the "As Built Drawings".

Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit and wiring servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

Provide revised typed circuit directory in panelboards that have circuits removed.

Repair adjacent construction and finishes damaged during demolition and extension work.

Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

Provide supplemental support for conduits that are routed through demolition area, and are to remain. Supplemental support shall be added so that the conduit meets the support requirements of electrical specification section 26 05 33.

END OF SECTION

SECTION 260504
CLEANING, INSPECTION, AND TESTING OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

SCOPE

The work under this section includes the required cleaning, inspection, adjustment, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work

PART 2 - PRODUCTS
- Not Used

PART 3 - EXECUTION
- General Inspection and Cleaning of All Electrical Equipment
- Grounding Systems
- Light Fixtures
- Occupancy Sensors

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

GENERAL INSPECTION AND CLEANING OF ALL ELECTRICAL EQUIPMENT

Inspect for physical damage and abnormal mechanical and electrical conditions.

Any item found to be out of tolerance, or in any other way defective as a result of the required inspection or testing, shall be reported to the City of Madison. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

Compare equipment nameplate information with the latest single line diagram and report any discrepancies.

Verify proper auxiliary device operation and indicators.

Check tightness of accessible bolted electrical joints. Use torque wrench method.

Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

Clean All Equipment:
- Vacuum inside of panelboards, switchboards, switchgear, transformer core and coils, bus ducts, MCC's, fire alarm panels, communication/data panels, security panels, etc.
- Loosen attached particles and vacuum them away.
- Wipe all insulators with a clean, dry, lint free rag.
- Clean insulator grooves.

Inspect equipment anchorage.

Inspect equipment and bus alignment.

Check all heater elements for operation and control.

Lubricate nonelectrical equipment per manufacturer's recommendations.

GROUNDING SYSTEMS

Inspect the ground system for adequate termination at all devices.

LIGHT FIXTURES

Check the bonding and proper lamping. Verify that recessed fixtures are installed with hold down clips. Confirm operation of the fixture with the proper switch or sensor.

OCCUPANCY SENSORS

Confirm operation of the sensor per the manufacturer’s specification.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

SCOPE

The work under this section includes furnishing and installing required wiring and cabling systems including pulling, terminating and splicing. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals
- Project Conditions

PART 2 - PRODUCTS
- General
- Building Wire
- Wiring Connectors

PART 3 - EXECUTION
- General Wiring Methods
- Wiring Installation in Raceways
- Wiring Connections and Terminations
- Field Quality Control
- Wire Color
- Branch Circuits
- Emergency Circuits

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 33 – Raceway and Boxes for Electrical Systems.
Section 26 05 53 – Identification for Electrical Systems.

REFERENCES

SPS 316- Electrical

SUBMITTALS

Submit product data: Provide for each cable assembly type.

Submit factory test reports: Indicate procedures and values obtained.

Submit shop drawings for modular wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.

Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

PROJECT CONDITIONS

Verify that field measurements are as shown on Drawings.

Conductor sizes are based on copper.

Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required for project conditions.

Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

GENERAL

All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

All conductors shall be copper. All ground conductors shall be copper.

Insulation shall have a 600 volt rating.

All conductors shall be stranded.

> Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

BUILDING WIRE

Description: Single conductor insulated wire 90 degree C.

Insulation: Type THHN/THWN-2, XHHW-2 insulation.

WIRING CONNECTORS

Split Bolt Connectors: Not acceptable.

Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment terminals. Not approved for splicing.

Twist Type Wire Connectors: Solderless twist type spring connector (wire-nut) with insulating cover for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller. The manufacturer’s wire fill capacity must be followed. Use Silicone filled twist type spring connectors in all wet location areas.

Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps. Connector must be installed with a crimper tool listed for use with the manufacturer and type of compression connector.

Insulation Piercing Connectors: Molded insulated body, copper teeth, wrench tightened, UL 486B Listed. May be used only for connection of a tap conductor in run and tap type applications when main conductor is 8 AWG and larger.

PART 3 - EXECUTION

GENERAL WIRING METHODS

All wire and cable shall be installed in conduit.

Do not use wire smaller than 12 AWG for power and lighting circuits.

All phase, neutral and ground conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 100 feet (30 m), and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet (61 m).

Ground conductor size shall be increased per NEC 250.122(B) when phase and phase/neutral conductors are increased in size.

Make conductor lengths for parallel conductors equal.

Splice only in junction or outlet boxes.

No conductor less than 10 AWG shall be installed in exterior underground conduit.

Identify ALL low voltage wire, 600V and lower, per section 26 05 53.

Neatly train and lace wiring inside boxes, equipment, and panelboards.

WIRING INSTALLATION IN RACEWAYS

Pull all conductors into a raceway at the same time. Use Listed water or silicone based wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary. Wax based lubricants are not allowed. Pulling lubricant is not required for low friction type products where the cable manufacturer recommends that cables be pulled without lube.

Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

Completely and thoroughly swab raceway system before installing conductors.

Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

In high ambient spaces, mechanical rooms, utility rooms and exterior exposed conduit, 90 degree C, XHHW-2 conductors shall be utilized.

WIRING CONNECTIONS AND TERMINATIONS

Splice only in accessible junction boxes.

Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.

All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

Use solderless twist type spring connectors (wire nuts) with insulating covers for wire splices and taps, 10 AWG and smaller.

Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of the wiring.

Thoroughly clean wires before installing lugs and connectors.

At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

FIELD QUALITY CONTROL

Field inspection and testing will be performed under provisions of Section 26 05 04.

WIRE COLOR

General:

Solid colored insulation is required for all THHN/THWN-2 wire. For other wire types use colored wire or identify wire with colored tape at all terminals, splices and boxes. Wire shall be colored as indicated below.

In existing facilities, use existing color scheme.

Switch legs shall be the same color as their associated circuit, except for the second switch leg used for dual-level switching. The second switch leg shall be the next phase color, e.g. if the first switch leg is brown (277/480V phase A), the second switch leg shall be orange (277/480V phase B).

Traveler conductors run between 3 and 4 way switches shall be colored pink or purple.

Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.

Feeder Circuit Conductors: Each phase shall be uniquely color coded.

Ground Conductors: Green colored insulation for THHN/THWN-2 wire. For other wire types use green colored wire or identify wire with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, contractor shall provide green with yellow tracer.

BRANCH CIRCUITS

The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All single-phase branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

EMERGENCY CIRCUITS

All Emergency, Legally Required Standby and Optional Standby system wiring shall be installed in separate raceways after their associated transfer switches. The wiring shall be separate from each other and from all normal system wiring.

All emergency wiring serving NEC 700 loads, requiring minimum 2 hour fire rating shall comply with NEC 700.10(D)(1).

END OF SECTION

SECTION 260523
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

SCOPE

The work under this section includes furnishing and installing cabling for remote-control, signaling and power-limited circuits. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals
- Project Conditions

PART 2 - PRODUCTS
- General
- Remote-Control and Signaling Cable
- Wiring Connectors

PART 3 - EXECUTION
- General Wiring Methods
- Wiring Installation In Raceways
- Free-Air Cable Installation
- Wiring Connections and Terminations
- Field Quality Control

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 33 – Raceway and Boxes for Electrical Systems.
Section 26 05 53 – Identification for Electrical Systems.

REFERENCES

NFPA 70 - National Electrical Code.

SUBMITTALS

Submit product data: Provide for each cable assembly type.

Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency.

PROJECT CONDITIONS

Verify that field measurements are as shown on Drawings.

Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

GENERAL

All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

All conductors shall be copper.

Insulation shall have a 600 volt rating.

All conductors shall be suitable for the application intended. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:

All conductors terminated with crimp type devices shall be stranded.

Stranded conductors shall be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors shall not be wrapped around a terminal screw but shall be terminated with a crimp type device or in an approved back wired method.

REMOTE-CONTROL AND SIGNALING CABLE

Refer to Section 28 31 00 for requirements for cable to be used on fire alarm systems.

Refer to Section 27 00 05 for requirements for cable to be used on communication systems.

All other systems cabling shall meet the requirements of NEC Article 725 and the following:

Cable for Class 1 Remote-Control, Signaling and Power-Limited Circuits: 600 volt insulation, individual conductors twisted together, shielded, and covered with an overall PVC jacket. Cable shall be Listed, temperature rated, and suitable Type (general purpose, riser or plenum) for the application as required in the National Electrical Code.

Cable for Class 2 or Class 3 Remote-Control, Signaling and Power-Limited Circuits shall be Listed, temperature rated, and suitable Type (general purpose, riser or plenum) for the application as required in the National Electrical Code.

WIRING CONNECTORS

Split Bolt Connectors: Not acceptable.

Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.

PART 3 - EXECUTION

GENERAL WIRING METHODS

Control-voltage cables shall be installed in conduit. However, they may be installed free-air (without conduit) above accessible ceilings if the cable meets NEC requirements for the application, unless specified to be in conduit in other sections of the specifications. See requirements for free-air cable installation below.

Control cables for controlling HVAC and lighting equipment connected to emergency power shall be routed in raceway.

Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts, all sizes subject to NEC 725 requirements.

Splice only in junction boxes.

Identify wire per section 26 05 53.

Neatly train and lace wiring inside boxes, and equipment.

WIRING INSTALLATION IN RACEWAYS

Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling conditions when necessary.

Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

FREE-AIR CABLE INSTALLATION

Cabling shall be neatly run at right angles and be kept clear of other trades work.

Cabling shall be supported at a maximum of 4-foot intervals utilizing "J-Hook" or "Bridal Ring" supports anchored to ceiling concrete, piping supports or structural steel beams. If cable sag at mid-span exceeds 12-inches, another support shall be provided. Cable supports shall be installed to maintain cable bend to larger than the minimum bend radius.

Cabling shall not be attached to or supported by existing cabling, plumbing or steam piping, ductwork, suspended ceiling supports or electrical or communications conduit. Do not place cable directly on the ceiling grid or attach cable in any manner to the ceiling grid wires.

To reduce or eliminate Electro-Magnetic Interference (EMI), the following minimum separation distances for 'Free-Air' cabling installations shall be adhered to:

- Twelve (12) inches from power lines of less than 5kV.
- Thirty-nine (39) inches from power lines of 5kV or greater.
- Five (5) inches from lighting fixtures.
- Thirty-nine (39) inches from transformers and motors.

A coil of 4 feet in each cable shall be placed in the ceiling at each 'free-air' wired device. These coils shall be secured (wire tied) at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

All cable shall be free of tension at both ends. Nylon strain relief connectors shall be provided at each device and junction box where cables enter. In cases where the cable must bear some stress, Kellum type grips may be used to spread the strain over a longer length of cable.

Cable manufacturers minimum bend radius shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

All exposed vertical cable extensions to devices located below the finished ceiling shall be in conduit.

Use suitable cable fittings and connectors.

WIRING CONNECTIONS AND TERMINATIONS

Splice only in accessible junction boxes (except splices to low voltage occupancy sensor power packs and terminations to temperature control devices).

All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.

Thoroughly clean wires before installing lugs and connectors.

At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

FIELD QUALITY CONTROL

Field inspection and testing will be performed under provisions of Section 26 05 04.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

SCOPE

The work under this section includes equipment grounding conductors, and bonding for Electrical and Communications systems. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Regulatory Requirements

PART 2 - PRODUCTS
- Mechanical Connectors
- Compression Connectors
- Conductors
- Bus/Busbar

PART 3 - EXECUTION
- General
- Less Than 600 Volt System Grounding
- Communication System Grounding
- Field Quality Control
- Identification and Labeling
- Construction Verification Items
- Warranty

All hardware, cables and related termination and support hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in this and related sections.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

REFERENCES

ANSI/IEEE 142 (Latest edition) - Recommended Practice for Grounding of Industrial and Commercial Power Systems
UL 467 Electrical Grounding and Bonding Equipment
IEEE 837 - IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding
TIA-607-C - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

REGULATORY REQUIREMENTS

Conform to requirements of NFPA 70.

Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

MECHANICAL CONNECTORS

The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lock washers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.

The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

COMPRESSION CONNECTORS

The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.

Each connector shall be factory filled with an oxide-inhibiting compound.

The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

The installation of the connectors shall be made with a compression tool and die system, as recommended by the manufacturer of the connectors, and shall be irreversible.

Pre-crimping of the ground rod is required for all irreversible compression connections to a ground rod.

Terminal lug for communication system grounding shall be compression type and conform to the following:

Material: Tin Plated Copper (aluminum not permitted).
Wire Size: to match conductor
Number of Stud Holes: 2
Stud Hole Size: 3/8”
Bolt Hole Spacing: per TIA-607-C
Tongue Angle: Straight

CONDUCTORS

Material: Stranded copper (aluminum not permitted).

Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used at the same facility.

Branch Circuit Equipment Ground shall be proportionately increased in size when routed with phase conductors increased in size.

Conductors for Telecommunications shall be as follows:

Telecommunications Bonding Conductor (TMGB to Service Ground): No. 3/0 minimum or as shown on drawings.
Telecommunications Bonding Backbone (TBB; TMGB to TGB): No. 3/0 minimum or as shown on drawings.
Telecommunications Grounding Equalizer (GE): No. 3/0 minimum or as shown on drawings.
Bonding Conductors shall be insulated with a Green Jacket or jacket marked with Green Tape or labeled per NEC Guidelines.

BUS/BUSBAR

Material: Copper (aluminum not permitted).

Size:

All Power systems: 1/4" X 2", length as needed (24” minimum).
Telecommunications Main Ground Busbar (TMGB): 1/4" x 4" x 20" long (minimum).
Telecommunications Grounding Busbar (TGB): 1/4" x 2" x 12" long (minimum).

Busbars:

Be pre-drilled to accommodate two-hole lugs.
3/8” stud hole size; hole spacing per TIA-607-C.
Incorporate insulators and stand-off brackets that electrically isolate busbar from mounting surface.

Provide main ground busbar located adjacent to main electrical service equipment to terminate all ground conductors. Refer to DFD grounding detail 26 05 26-1.

PART 3 - EXECUTION

GENERAL

Install Products in accordance with manufacturer's instructions.

Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.

Attach grounds permanently before permanent building service is energized.

Terminate each grounding conductor on its own terminal lug. Sharing a single lug by multiple conductors is not allowed.

All grounding electrode conductors and individual grounding conductors shall be installed in PVC conduit, in exposed locations.

LESS THAN 600 VOLT ELECTRICAL SYSTEM GROUNDING

Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.

Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

COMMUNICATION SYSTEM GROUNDING

Grounding and Bonding System for Communications shall be an isolated grounding system with a single ground point. That ground point is to be the common grounding electrode system at the building electrical service entrance (main ground bar located in electrical room).

The system shall be compliant with ANSI J-STD-607-B with the exception that the ground cable shall not be bonded to building steel except at the electrical service entrance.

Provide Grounding Busbar for Telecommunications at each Telecommunications Room, the Main Equipment Room and at the electrical service entrance per project drawings. Coordinate Busbar location(s) and conductor routing per drawings with Division 27 contractor.

Provide Telecommunications Bonding Conductor from Telecommunications Main Grounding Busbar (TMGB) at the Communications Entrance Facility to building common grounding electrode system. Attach grounding conductor to building steel as allowed only at the main electrical service entrance. Provide physical protection as required.

Provide Telecommunications Bonding Backbone (TBB) conductor from the TMGB to Telecommunications Grounding Busbar (TGB) at each Telecommunication Room, Telecommunications Equipment Room and Telecommunications Enclosure.

- TBB shall be continuous and not connected through Telecommunications Grounding Busbars (TGBs).
- Bond TGBs to TBB via tap off of TBB. Gauge of conductor to be same at TBB.
- Leave 10 feet slack in conductor from TBB to TGB at TGB location(s).
- Do not bond TBB or TGB to building steel at TGB location(s).

FIELD QUALITY CONTROL

Inspect grounding and bonding system conductors and connections for tightness and proper installation.

Provide resistance test at each electrical and telecommunications Busbar to ground.

IDENTIFICATION AND LABELING

Label Grounds at point of termination.

CONSTRUCTION VERIFICATION

Record locations of all electrical and telecommunications grounding electrodes, busbars and grounding conductors as installed including recorded ground resistance test results.

WARRANTY

See Division 1, General Conditions, and General Requirements.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

SCOPE

The work under this section includes conduit and equipment supports, straps, clamps, steel channel, etc., and fastening hardware for supporting electrical work. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals
- Quality Assurance

PART 2 - PRODUCTS
- Material

PART 3 - EXECUTION
- Installation

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 53 – Identification for Electrical Systems

SUBMITTALS

Product Data: Provide data for support channel.

QUALITY ASSURANCE

Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

MATERIAL

Support Channel

- Epoxy Painted:
  - Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33, then painted with water born epoxy applied by a cathodic electro-deposition process.
  - All fittings and hardware shall be zinc plated in accordance with ASTM B633 (SC3 for fittings, SC1 for threaded hardware).
- Hot-dip Galvanized Steel:
  - Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be hot-dip galvanized after fabrication in accordance with ASTM A123.
  - Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123.
  - All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3.
  - All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.

- Stainless Steel:
    - All strut, fittings and hardware shall be made of AISI Type 304 or Type 316 stainless steel as indicated.

Conduit Supports

- Conduit clamps, straps, supports, etc., shall be steel or malleable iron.

- One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.

- Above suspended ceilings, bar joist conduit hangers: Spring Steel Clips with Snap-Close Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees and shall snap close around the conduit. Push-in type conduit clamps are not allowed. Spring clips shall require a hammer to install onto supporting surface.

- Stud wall applications: Spring Steel Clips with Push-in or Snap-Close Conduit Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees. Spring clips shall require a fastener to install onto stud.

- Box/conduit hanger with rod/wire clip (a.k.a. antlers): One assembly provides support for electrical box and conduit from drop wire or rod. Conduit clamps shall snap close around the conduit.

- Spring Steel Clip products shall be provided with corrosion resistance and be warranted against failure from corrosion for a period of ten (10) years from date of manufacture.

Threaded Rod: Minimum sized threaded rod for supports shall be 3/8" for trapezes and single conduits 1-1/4" and larger, and ¼" for single conduits 1" and smaller.

Hardware: Corrosion resistant, or as noted for each product above.

PART 3 - EXECUTION

INSTALLATION

Fasten hanger rods, conduit clamps, and outlet-, junction-, and pull-boxes to building structure using pre-cast insert system, preset inserts, beam clamps, or expansion anchors.

Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.

Powder-actuated fasteners are not permitted.

Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not fasten to suspended ceiling grid system.

Do not drill structural steel members unless approved by City of Madison.

Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

Support Channel

Use one of the following types of support channel as appropriate for the installed environment:

- Indoor: Epoxy Painted Steel, Hot-dipped Galvanized Steel, or as noted on the drawings.

- Field cuts: File and de-bur cut ends of support channel and paint to prevent rusting. For epoxy-painted support channel, paint cut ends to match the original color. For hot-dipped galvanized support channel, spray cut ends with cold galvanized paint.

Support Wires

- Support wires that are installed in addition to the ceiling grid support wires to provide secure support for raceways, cables assemblies, boxes, cabinets, and fittings shall be secured at both ends (e.g. the ceiling structure at the top and the ceiling grid at the bottom) per NEC 300.11(A).

- Compressed-air power-actuated fasteners may ONLY be used for the installation of separate ceiling wires required for support of conduits and aircraft cable hung light fixtures.

- Support wires shall be identified per specification section 26 05 53.

Spring Steel Clip Conduit Supports

- Above suspended ceilings: Spring steel clips with snap-close clamps may be used to support conduit from bar joist (steel truss) systems above suspended ceilings.

- Stud wall applications: Spring steel clips with push-in or snap-close conduit clamps may be used to support conduit in interior metal stud wall applications. Use screw fasteners to install conduit clamp onto stud.

- Box/conduit hanger with rod/wire clip (a.k.a. antlers): These may only be used in limited applications with the pre-approval of the State of Wisconsin Electrical Inspector.

END OF SECTION

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SECTION 260533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

SCOPE

This section describes the products and execution requirements relating to furnishing and installing raceways and boxes and related systems as part of a raceway system for electrical, communications, and other low-voltage systems for the project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals

PART 2 - PRODUCTS
- General
- Rigid Metal Conduit (RMC) and Fittings
- Intermediate Metal Conduit (IMC) and Fittings
- Electrical Metallic Tubing (EMT) and Fittings
- Liquidtight Flexible Metal Conduit (LFMC) and Fittings
- Conduit Supports
- Surface Metal Raceway
- Pull and Junction Boxes
- Outlet Boxes
- Boxes for Audio-Video Equipment
- Boxes for Fire Alarm Audio-Visual Notification Appliances

PART 3 - EXECUTION
- Conduit Sizing, Arrangement, and Support
- Conduit Installation
- Conduit Installation Schedule
- Surface Metal Raceway and Multi-Outlet Assembly Installation
- Coordination of Box Locations
- Pull and Junction Box Installation
- Outlet Box Installation
- Audio-Video System Box and Conduit Installation

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 26 05 26 – Grounding and Bonding for Electrical Systems
Section 26 05 29 – Hangers and Supports for Electrical Systems
Section 26 27 02 – Equipment Wiring Systems
Section 26 27 26 – Wiring Devices.
Section 27 00 05 – Communications Cabling
Section 28 31 00 – Fire Detection and Alarm

REFERENCES

ANSI/TIA-569-C-Telecommunications Pathways and Spaces

SUBMITTALS

Surface Raceway System - submit product data and catalog sheets for all components.

Boxes - provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

GENERAL

All steel fittings and conduit bodies shall be galvanized.

No cast metal or split-gland type fittings permitted.

Mogul-type condulets larger than 2 inch (50 mm) not permitted except as approved or detailed.

All condulet covers must be fastened to the condulet body with screws and be of the same manufacture.

C-condulets shall not be used in lieu of pull boxes.

All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

RIGID METAL CONDUIT (RMC) AND FITTINGS

Conduit: Heavy wall threaded, galvanized steel, schedule 40.

Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

Expansion Fittings/Expansion Joints: Expansion Fittings shall be Internal Grounding type and shall not rely on external bonding jumpers to maintain grounding continuity between raceway components.

INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

Conduit: Galvanized steel, threaded.

Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

Expansion Fittings/Expansion Joints: Expansion Fittings shall be Internal Grounding type and shall not rely on external bonding jumpers to maintain grounding continuity between raceway components.

ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

Conduit: Steel, galvanized tubing.

Fittings: All steel, set screw type. No push-on or indenter types permitted.
Conduit Bodies: All steel threaded conduit bodies.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) AND FITTINGS

Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, sunlight-resistant jacket.

Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

CONDUIT SUPPORTS

See section 26 05 29.

SURFACE METAL RACEWAY

Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

Provide as directed on the plans.

PULL AND JUNCTION BOXES

Interior Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

Interior Sheet Metal Boxes larger than 12 inches (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover.

Boxes 9 square feet and larger shall have hinged covers. Single covers shall not exceed 10 square feet.

Interior Sheet Metal Boxes connected to an exterior underground raceway shall have a drain hole located in the bottom of the box.

Box extensions and adjacent boxes within 48 inches of each other are not allowed for the purpose of creating more wire capacity.

Junction boxes 6 inch-by-6 inch or larger size shall be without stamped knock-outs.

Wireways shall not be used in lieu of junction boxes.

OUTLET BOXES

Sheet Metal Outlet Boxes: galvanized steel, with stamped knockouts.

Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8 inch male fixture studs where required.

Concrete Ceiling Boxes: Concrete type.

Cast Boxes: Cast ferroalloy or aluminum, deep type, gasketed cover, threaded hubs.

BOXES FOR AUDIO-VIDEO EQUIPMENT

Provide floor, wall, and/or ceiling boxes for Audio-Video (AV) Equipment as indicated on the Electrical and/or Audio-Video drawings.

FLAT SCREEN MONITOR BOXES

Provide a recessed wall box for mounting behind flat screen monitors, allowing the screens to sit flush against the wall. These boxes shall provide a neat and secure environment for the audio, video, control and power connections.

The recessed wall box shall install easily between any two standard studs in the wall. Connections and cable entry can be on the top or the bottom depending on installation preference.

The recessed wall box shall be provided with one low-voltage conduit entry box and Nationally Recognized Testing Laboratory (NRTL) listed single gang box for AC power.

The recessed wall box cover shall be provided in white or black and shall be suitable for painting. The cover shall have a cable exit slot for the display connections and the excess cable can easily be hidden inside of the box making the entire installation as clean as possible. The cover screws onto the front of the box once all connections are in place.

The recessed wall box shall be designed for new or existing construction. Brackets shall be included for mounting to studs in new construction as well as surface mount clips for mounting to sheet rock or plywood in existing construction.

BOXES FOR FIRE ALARM AUDIO-VISUAL NOTIFICATION APPLIANCES

Recessed boxes for Fire Alarm audio, visual, and audio-visual notification appliances shall be galvanized steel sheet metal with stamped knockouts. Boxes shall be painted red.

For surface mounting, use manufacturer supplied back boxes and trim plates, painted red or off white to match device color, and shall contain no visible conduit knock-outs. Mark each device with its circuit number.

PART 3 - EXECUTION

CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

EMT is permitted to be used in sizes 4 inch (100 mm) and smaller for power and low-voltage systems. See CONDUIT INSTALLATION SCHEDULE below for other limitations for EMT and other types of conduit.

Size power conductor raceways for conductor type installed. Conduit size shall be 1/2 inch (16 mm) minimum except **all homerun conduits shall be 3/4 inch (21 mm),** or as specified elsewhere. **Caution: Per the NEC, the allowable**

conductor ampacity is reduced when more than three current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.

Size communications and other low-voltage systems raceways as follows:

Communications, including Outlet Box: 1 inch minimum. Conduit used for single device locations (e.g. Wireless Access Point, Video Surveillance Camera, and Wall mounted telephone) may be 3/4 inch minimum.

Control, security, signal, video, and other low-voltage applications: 3/4 inch minimum.

Fire Alarm: 1/2 inch minimum.

Provide one raceway from each communications outlet box to above accessible ceiling.

Arrange conduit to maintain 6'-8" clear headroom and present a neat appearance.

Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

Maintain minimum 6 inch (150 mm) clearance between conduit and piping. Maintain 12 inch (300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay-in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.

Group conduit in parallel runs where practical and use conduit rack (lay-in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.
Support and fasten metal conduit at a maximum of 8 feet (2.4 m) on center.

Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.

Conceal all conduits except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical rooms.

Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

For indoor conduits, no continuous conduit run shall exceed 100 feet (30 meters) without a junction box.

All conduits installed in exposed areas shall be installed with a box offset before entering box.

CONDUIT INSTALLATION
Cut conduit square; de-burr cut ends.

Conduit shall not be fastened to the corrugated metal roof deck.

Bring conduit to the shoulder of fittings and couplings and fasten securely.

Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.

Threads cut in the field, and factory threads of conduit and nipples not coated with corrosion protection, shall be coated with an approved electrically conductive corrosion compound per NEC 300.6.

Corrosion inhibitor, when used in a food service environment, shall be approved for Food Service locations.

Terminate all conduit (except for terminations into conduit bodies) using conduit hubs, or connectors with one locknut, or utilize double locknuts (one each side of box wall).

Provide bushings for the ends of all conduit not terminated in a box. Refer to Section 26 05 26 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.

Provide insulated bushings where raceways contain 4 AWG or larger conductors.

Communication and Low Voltage systems conduits shall terminate in horizontal plane.

Install no more than the equivalent of:

Three 90 degree bends between boxes for electrical systems.

Two 90 degree bends between boxes for communications and other low voltage systems. Note: Offsets shall be considered 90 degrees.

No single bend may exceed 90 degrees.

Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch (50 mm) size unless sweep elbows are required.

Bend conduit according to manufacturer's recommendations. Torches or open flame shall not be used to aid in bending of PVC conduit.

Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.

Provide 1/8 inch (3 mm) nylon pull string in empty conduit, except sleeves and nipples.
Install listed expansion-deflection fitting or other approved means shall be used where a raceway crosses a structural joint for expansion, contraction or deflection, used in buildings, bridges, parking garages or other structurers.

Route conduit through roof openings for piping and ductwork where possible.

Where communication cabling is to be installed in conduit to the wiring hub (e.g. Telecom Room), multiple conduits may be consolidated into fewer, larger conduits. Capacity of shared conduits shall equal the capacity of the individual conduits unless otherwise noted.

Use NRTL listed metallic grounding clamps when terminating conduit to cable tray.

Ground and bond conduit under provisions of Section 26 05 26.

Conduit is not permitted in any slab topping of two inches (50 mm) or less.

Identify conduit under provisions of Section 26 05 53.

CONDUIT INSTALLATION SCHEDULE
Conduit other than that specified below for specific applications shall not be used.

- Concealed Dry Interior Locations: Rigid Metal conduit, Intermediate Metal conduit, Electrical Metallic Tubing.

- Exposed Dry Interior Locations: Rigid Metal conduit, Intermediate Metal conduit, Electrical Metallic Tubing.

- Motor and equipment connections: Liquidtight flexible metal conduit (LFMC) (all locations). Minimum length shall be one foot (300 mm); maximum length shall be three feet (900 mm). Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

- Light fixtures: Refer to specification section 26 51 13.

SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY INSTALLATION

Use flat-head screws to fasten channel to surfaces every twenty-four (24) inches. Mount plumb and level.

Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

Maintain grounding continuity between raceway components to provide a continuous grounding path under provisions of Section 26 05 26.

Fastener Option: Use clips and straps suitable for the purpose.

COORDINATION OF BOX LOCATIONS

Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.

Conduit and boxes shall not be fastened to the metal roof deck. If conduit and boxes are required to be located and installed on roof decks, the conduit and boxes are required to be spaced minimum 1-5/8 inch off the lowest part of the metal roof decking material, per NEC 300.4 (E).

It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.

The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch (450 mm) by 24 inch (600 mm) access doors. Boxes must be installed within 12” from edge of the access door.

Locate and install to maintain headroom and to present a neat appearance.

Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

PULL AND JUNCTION BOX INSTALLATION

Boxes shall be minimum 4 inches square (100 mm) by 2 1/8 inches (54 mm) deep for use with 1 inch (25 mm) conduit and smaller. On conduit systems using 1 1/4 inch (31.75 mm) conduit, minimum box size shall be 4 11/16 inches square by 2 1/8 inches deep.

Where used with raceway(s) containing conductors of 4 AWG or larger, box shall be sized as required unless otherwise noted on the drawings.

Where used with raceway(s) containing conductors on systems over 600V, size box per NEC 314 Part IV unless otherwise noted as larger on the drawings.

Size boxes for communications per ANSI/TIA-568-C.

Locate boxes above accessible ceilings, in unfinished areas or furnish and install approved access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.

Provide boxes for communications and other low voltage applications (a) in any section of conduit longer than 100 feet, (b) where there are bends totaling more than 180 degrees between pull points or pull boxes and (c) wherever there is a reverse bend in run. Locate boxes on straight section of raceway (e.g. do not use boxes in place of raceway bends).

Support boxes independent of conduit.

OUTLET BOX INSTALLATION

Do not install boxes back-to-back in walls. Provide minimum 6 inch (150 mm) separation, except provide minimum 24 inch (600 mm) separation in acoustic-rated walls.

Power:

Recessed (1/4 inch maximum) outlet boxes in masonry, concrete, tile construction, or drywall shall be minimum 4 inch square, with device rings. Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes. A single gang box can be used in drywall and masonry, for a single device location, when a single conduit enters box.

Shallow 4 inch square by 1 1/2 inch deep boxes can be used as device boxes for power provided the box and plaster ring is sized for installed device and conductors.

Low Voltage:

Recessed (1/4 inch maximum) outlet boxes in masonry, concrete, tile construction or drywall shall be minimum 4 11/16 inch square by 2 1/8 inch deep with single gang device ring (unless noted otherwise on drawings). Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.

Provide one conduit from each communications outlet box. Conduit runs between outlet boxes for communications are not allowed. Terminate conduit above accessible ceiling in corridor.

Provide knockout closures for unused openings.

Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches (300 mm) of box.

Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.

Install boxes in walls without damaging wall insulation.

Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

Ceiling outlets shall be 4 inch square, minimum 2 1/8 inch (54 mm) deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans.

In inaccessible ceiling areas, position outlets and junction boxes within 6 inches (150 mm) of recessed luminaire, to be accessible through luminaire ceiling opening.

Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

Provide cast ferroalloy or aluminum outlet boxes in exterior and wet locations.

Surface wall outlets shall be 4 inch (100 mm) square with raised covers for one and two gang requirements. For three gang or larger requirements, use gang boxes with non-overlapping covers.

AUDIO-VIDEO SYSTEM BOX AND CONDUIT INSTALLATION

Conduit requirements for AV systems cabling may differ from those of other trades. It is important that the electrical contractor become familiar with these specialized requirements. AV systems cabling must be enclosed within continuously grounded ferrous metallic conduit or raceway. PVC conduit is not acceptable. Conduit and raceway is to be furnished and installed by electrical contractor. Conduits containing different wiring classes must maintain minimum separations to minimize interferences from electrical noise. Conduits sizes and quantities shown on bid documents are minimums. Separate conduit runs specified in bid documents may not be combined for any purpose.

Provide AV boxes as shown on the Electrical and/or Audio-Video drawings. Install boxes at heights and locations as indicated on the drawings. Coordinate all box installations with the AV equipment provider.

Flat screen monitor boxes shall be installed so that all cabling is concealed behind the monitor. Coordinate box location with flat screen mounting brackets so that the box cover and cables are not blocked by the brackets.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

SCOPE

The work under this section includes the products and execution requirements relating to labeling of power, control, signaling and fire alarm wiring. Further, this section includes the installation of labels, nameplates, and directories for electrical boxes, wiring devices, and equipment. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals

PART 2 - PRODUCTS
- Materials

PART 3 - EXECUTION
- General
- Box Identification
- Communication Conduit Labeling
- Power, Control and Signal Wire Identification
- Wiring Device Identification
- Support Wire Identification
- Nameplate Engraving for Electrical Equipment
- Panelboard Directories

RELATED WORK

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

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
Section 26 05 23 – Control-Voltage Electrical Power Cables

SUBMITTALS

Include schedule for nameplates.

Prior to installation, the Contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used. Samples shall be mounted on 8 1/2" x 11" sheets annotated, explaining their purposed use.

PART 2 - PRODUCTS

MATERIALS

Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED.

Wire Labels: All wiring labels shall be white/transparent vinyl or vinyl-cloth, self-laminating, wraparound type. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

Tape (wiring phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

Nameplates: Engraved three-layer laminated plastic. Normal system shall use nameplates with black letters on white background, emergency system (NEC 700) shall use white letters on red background.

See Box Identification and Wiring Device Identification sections for allowed usage of permanent marker.

PART 3 - EXECUTION

GENERAL

Where mixed voltages are used in one building (e.g. 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction and pull box, equipment, etc., on each system shall be labeled for voltage in addition to other requirements listed herein.

All branch circuit and power panels shall be identified with the same symbol used in circuit directory in main distribution center.

Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent. Install all labels firmly as recommended by the label manufacturer. Labels shall be installed plumb and neatly on all equipment.

Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.

Embossed tape shall not be permitted for any application.

BOX IDENTIFICATION

The following junction and pull boxes shall be identified utilizing spray painted covers:

System	Color(s)
Secondary Power – 208Y/120V, 240/120V	White
Emergency System (NEC 700) – 208Y/120V	White/Red
Fire Alarm (see below)	Red
Temperature Control	Green
Door Access Control	Orange
Communications	Blue

All boxes with power wiring shall be further identified with circuit numbers and source panel designation as follows:

- All outlet and device boxes shall use machine-generated adhesive labels, or neatly hand-written permanent marker.

- All exposed junction and pull boxes larger than 8" square shall utilize engraved nameplates with ½" minimum letter height. All exposed junction and pull boxes 8" square or smaller shall utilize machine-generated adhesive labels.

- All junction and pull boxes located above an accessible ceiling shall utilize machine-generated adhesive labels, or neatly hand-written permanent marker.

All fire alarm boxes (covers and outer sides) shall be painted red and labeled "Fire Alarm" or "FA". When red conduit is used for the alarm system installation, there is no need to paint the box sides, - paint the covers only. Non-factory device boxes shall also be painted red.

Other system boxes shall be further identified as shown on drawing details or approved shop drawings.

COMMUNICATIONS CONDUIT LABELING

Provide label on all conduits installed between Telecommunication Equipment Rooms. Both ends of the conduits shall be labeled. All labels shall be mechanical, no hand-written labels.

The label shall indicate the location of the far end of the conduit run and a unique conduit number. (i.e. TR-1A-01 or Room #216 – 01). Refer to agency standards where applicable.

POWER, CONTROL AND SIGNALING WIRE IDENTIFICATION

Provide wire labels on each conductor in panelboard gutters, all boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control and signaling wires.

All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated, including wiring used for temporary purposes.

WIRING DEVICE IDENTIFICATION

Wall switches, receptacles, occupancy sensors, photocells, poke-through fittings, access floor boxes, and time clocks shall be identified with circuit numbers and source (ex. Panel ABC-3). In exposed areas, identifications should be made inside of device covers, unless directed otherwise. Use machine-generated adhesive labels, or neatly hand-written permanent marker.

SUPPORT WIRE IDENTIFICATION

Support wires that are installed in addition to the ceiling grid support wires to provide secure support for raceways, cables assemblies, boxes, cabinets, and fittings shall be distinguishable from the ceiling grid support wires per NEC 300.11(A). This identification shall be either approximately 6 inches of fluorescent orange paint, or orange tape flags 3/4 inches high-by-2 inches wide (minimum) within 12 inches of the bottom of the support wires.

NAMEPLATE ENGRAVING FOR ELECTRICAL EQUIPMENT

Provide nameplates of minimum letter height as scheduled below.

Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, and Motor Starters: ½ inch (13 mm); identify source and load served.

PANELBOARD DIRECTORIES

Update existing directories with typed directories.

END OF SECTION

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SECTION 262702
EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

SCOPE

The work under this section includes electrical connections to equipment specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:

-Misc. Equipment
-HVAC and Plumbing motors, VFDs, and panels
-Kitchen, Dishwashing and Laundry Equipment

Included are the following topics:

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
Section 26 05 33 – Raceway and Boxes for Electrical Systems

SUBMITTALS

Product Data: Provide data for cord and wiring devices.

COORDINATION

Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 - PRODUCTS

CORDS AND CAPS

Straight-blade Attachment Plug: NEMA WD 1.

Locking-blade Attachment Plug: NEMA WD 5.

Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

Cord Construction: Oil-resistant thermoset insulated multi-conductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

OTHER PRODUCTS

Refer to related sections for other product requirements.

PART 3 - EXECUTION

INSPECTION

Verify that equipment is ready for electrical connection, wiring, and energizing.

PREPARATION

Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

INSTALLATION

Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

Provide a green equipment ground conductor for all installed equipment wiring.

Make conduit connections to equipment using flexible PVC-coated metal conduit.

Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

MISCELLANEOUS CONNECTIONS

Hand Dryers: Provide handle lock on source circuit breaker to serve as required lock open disconnect.

Drinking Fountains and Bottle Fill Fountains: Provide GFCI source circuit breaker to serve receptacle at fountain.

HVAC AND PLUMBING CONNECTIONS

Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.

Contractor shall verify with mechanical contractor the electrical requirements including voltages, horsepower, disconnecting means, starters and variable frequency drives for motors and equipment prior to ordering circuit breakers, disconnects and starters.

Provide 120 volts to each temperature control panel. Coordinate quantity and exact locations with HVAC/DDC contractors.

Unless otherwise specified, all electrical control devices such as aqua-stats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.

Provide 120V, single phase 15 ampere circuit and switching means to serve factory installed interior lighting within each HVAC unit.

Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

Check for proper rotation of each motor.

KITCHEN, DISHWASHING AND LAUNDRY EQUIPMENT CONNECTIONS

Check loose equipment delivered to job by equipment installer against approved shop drawings or other required Drawings. Loose electrical equipment including disconnects, starters, thermostats, controls, local and remote switches furnished by equipment contractor shall be installed by electrical contractor.

Review dimensioned equipment layouts, detailed shop drawings of equipment, wiring, control and final connection diagrams available from the equipment supplier.

Provide non-fused disconnect switches serving equipment. Equipment installed in damp or wet locations shall be provided with NEMA 4X enclosures.

Provide Rigid Metal Conduit (RMC) or Intermediate Metal Conduit (IMC) for all surface conduit and fittings in these spaces.

Equipment contractor will receive all equipment and position in place.

Electrical Contractor shall rough in for equipment only from approved equipment shop drawings.

Rough in location shall be within three inches of equipment. If direct connection is required, use liquid-tight flexible conduit. If receptacle connection is required, verify proper receptacle configuration with equipment installer.

Final connections shall include extension of all service to each piece of equipment. All labor and material required to completely connect the equipment ready to operate shall be included in the final connections. All control wiring not integral with equipment shall be included.

Provide all required power and control wiring. This may include (but is not limited to) the following:

Provide pushbutton switch or manual starter for exhaust fan.

Provide emergency branch circuit for fire suppression system (if applicable). Wire automatic heat detectors or manual station so, when activated, valve of dry chemical bottle opens, gas solenoid valve shuts down, all dampers close, and make-up fans shut down, electrical power contactor opens (integral in equipment), and building fire alarm system is activated. Provide all required wiring, conduit and final connections. Refer to wiring diagrams supplied with equipment.

Provide wash-down system wiring; refer to schematic wiring diagrams supplied with hoods. Interconnect fire prevention system with wash-down system so wash-down system is activated upon alarm.

EQUIPMENT CONNECTION SCHEDULE

As indicated on the drawings.

END OF SECTION

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SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

SCOPE

This section describes the products and execution requirements relating to furnishing and installing wiring devices and related systems for the project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals
- Operation and Maintenance Data

PART 2 - PRODUCTS
- Modularly Connected (Modular) Devices
- Wall Switches
- Receptacles
- Occupancy Sensors
- Emergency Lighting Control Units
- Wall Dimmers
- Device Plates and Box Covers

PART 3 - EXECUTION
- Installation
- Field Quality Control
- Occupancy Sensors
- Adjusting

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

SUBMITTALS

Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.

For occupancy sensor shop drawings, the manufacturer’s actual layout of occupancy sensors and the wiring diagrams shall be provided.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

MODULARLY CONNECTED (MODULAR) DEVICES:

Modularly connected devices are allowed, but not required.

Modular Pigtailed Connector: Polarized connector with minimum six-inch stranded copper wire leads, polycarbonate right-angle housing, UL498 listed, with finger-safe connector housing which provides insulation from conductive surfaces. Contacts shall be brass. Connector shall be manufactured so that it provides a secure connection such that it will maintain contact with the device until the device is removed for replacement. Modular connectors shall be provided with covers which protect the contacts from paint, drywall mud, and construction dust and debris. Connectors shall be Hubbell SNAPConnect, Leviton Lev-Lok, Pass & Seymour PlugTail, or approved equal.

WALL SWITCHES

General: Heavy duty use toggle switch, rated 20 amperes and 120 volts AC. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be heavy duty Specification Grade.

Handle: Ivory made of nylon or high impact resistant material. Refer to plans for specific areas where brown or black devices/plates are required.

All switches on emergency circuits shall have a red handle with matching red cover plate.

Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG, with separate green ground screw. Switches shall be as follows:

Hubbell 1221*,
Leviton 1221-S*,
Pass & Seymour CSB20AC1-*,
or approved equal. (* indicates color selection).

Modular Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Switches shall be as follows:

Hubbell SNAP1221*NA,
Leviton M1221-*,
Pass & Seymour PT20AC1-*,
or approved equal. (* indicates color selection).

RECEPTACLES

General Requirements: NEMA Type 5-20R, ivory nylon or high impact resistant face. Receptacles shall be UL498 Listed and meet Federal Specification WC-596. All duplex receptacles shall be heavy duty Specification Grade, 20 amp rated. Refer to plans for specific areas where brown or black devices/plates are required.

Generally, all receptacles shall be duplex convenience type unless otherwise noted.

All receptacles on emergency circuits shall have a red face with matching red cover plate.

All receptacles installed in bathrooms, kitchens, and within 6 feet of the outside edge of sinks shall be GFCI type.

All receptacles installed in outdoor locations, garages, rooftops, and in other damp or wet locations shall be GFCI type with a weather-resistant (WR) rating.

Convenience and Straight-blade Receptacles: All receptacles shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG, with a separate green ground screw. Receptacles shall be as follows:

Hubbell 5362*,
Leviton 5362-*,
Pass & Seymour PS5362*,
or approved equal. (* indicates color selection).

GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class A, including self-test functionality and reverse line-load misfire function repeatability. GFCI receptacles shall be as follows:

Hubbell GFR5362SG*,
Leviton GFNT2-*,
Pass & Seymour 2097*,
or approved equal. (* indicates color selection).

GFCI Receptacles with a weather-resistant (WR) rating: Weather-Resistant duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class-A, including self-test functionality and reverse line-load misfire function repeatability. WR GFCI receptacles shall be as follows:

Hubbell GFR5362SG*,
Leviton GFWR2-*,

Pass & Seymour 2097TRWR*,
or approved equal. (* indicates color selection).

USB Charger Receptacles: Do not use combination duplex receptacles with USB chargers. Use duplex receptacles as required for the application and as specified herein. Use separate 4-port USB charging devices.

USB Charging Devices: Single-gang 4-port USB charging station. USB ports shall meet UL94 for 5V flammability rating, and shall comply with battery charging specification USB BC1.2. USB ports shall be compatible with USB 1.1/2.0/3.0 devices, including Apple products. USB ports shall be rated 5VDC, 4.2A minimum. Devices shall be as follows:

Hubbell USB4*,
Leviton USB4P-*,
Pass & Seymour TM8USB4*CC6,
or approved equal. (* indicates color selection).

Locking-Blade Receptacles: As indicated on drawings.

Specific-use Receptacle Configuration: As indicated on drawings.

Modular Convenience and Straight-blade Receptacles: Receptacles shall be as follows:

Hubbell SNAP5362*A,
Leviton M5362-*,
Pass & Seymour PT5362*,
or approved equal. (* indicates color selection).

Modular GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class A, including self-test functionality and reverse line-load misfire function repeatability. GFCI receptacles shall be as follows:

Hubbell GFRST83SNAP*,
Leviton MGFN2-*,
Pass & Seymour PT2097*,
or approved equal. (* indicates color selection).

Modular GFCI Receptacles with a weather-resistant (WR) rating: Use back and side wired devices in lieu of modular weather-resistant rated GFCI receptacles.

OCCUPANCY SENSORS

General Requirements: All occupancy sensors shall be hardwired type; battery type shall not be permitted.

Sensors shall use either passive infrared, or if dual technology, passive infrared and passive acoustic sensing or passive infrared and ultrasonic sensing for detecting room occupancy.

Sensitivity shall be user adjustable or self-adjusting type.

The delay timer shall be adjusted within a range of 6 to 30 minutes by the contractor in the field. The sensor shall have a test mode for performance testing.

The test LED shall indicate motion.

Line voltage sensors are acceptable, especially in exposed ceiling areas where all wiring shall be installed in conduit, including low voltage cabling if power packs are used. Provide power pack as required for low voltage sensors.

See drawings for actual types of sensors.

Occupancy sensors and power packs shall have five year warranties.

Wall Mounted (Wall Switch Type): The unit shall fit in/on a standard single gang switch box.

Rated capacity: 600 watts minimum at 120 volts, 60 Hz.

The sensor shall have two switches where dual-level lighting is required. The switch shall have manual override for positive OFF and automatic ON.
The area of coverage shall be approximately 180 degrees by 35-40 feet.

Ceiling Mounted: The unit shall fit in/on a standard octagon box. All ceiling mounted sensors shall be installed to a box with ring and box support.

The coverage area shall be 360 degrees by approximately 15 feet radius when mounted at 9 foot height. The sensor shall have provisions, such as masking, to block out problem areas.

Ceiling/Corner Mounted: The unit shall fit in/on a standard octagon box. All ceiling mounted sensors shall be installed to a box with ring and box support.

The coverage area shall be 90 degrees or greater by approximately 40 feet radius when mounted at 9 foot height. The sensor shall have provisions, such as masking, to block out problem areas.

Power Packs: Provide power packs as required for low voltage sensors. Rated capacity shall be 20 amps at 120 volts.

The unit shall fit on a standard octagon box. All power packs shall be installed onto a supported box.

Low voltage cabling shall be plenum rated or installed in conduit in plenum-rated areas.

Auxiliary Contacts for HVAC Interlock: Provide auxiliary dry contacts for HVAC BAS interlock when required. Refer to the "Occ Sensor Interlock" column in the Air Terminal Schedule(s) on the HVAC drawings. When required, provide auxiliary contacts regardless if the occupancy sensors are line or low voltage.

The occupancy sensors and auxiliary contacts shall be wired such that the sensor still detects occupancy and controls the auxiliary contacts regardless if the light switch(es) are in the OFF position (e.g. the occupant has turned the lights OFF because there is enough daylight, but the occupant is still occupying the space, and the occupancy sensor senses the occupant and closes the auxiliary contacts for BAS input).

The BAS wiring to the auxiliary contacts shall be by the Division 23 contractor.

EMERGENCY LIGHTING CONTROL UNITS

General Requirements: The Emergency Lighting Control Unit (ELCU) shall automatically illuminate connected emergency lighting upon utility power interruption, regardless of room switch position or occupancy sensor state.

The ELCU shall be UL 924 listed.

Warranty shall be 5 year replacement warranty.

Local room switch or lighting control shall turn both normal and emergency luminaires ON at the same time (no dedicated emergency room switch required).

The ELCU shall have a minimum load rating of 20 Amps at 120V, 1800W Tungsten at 120V,
1 HP, or general use 20 Amp circuits.

The ELCU shall accept 120V, 60Hz Input & Output (voltage tolerance +/- 15%).

The ELCU shall include emergency power and normal power indicator LEDs, and a manual test switch.

The ELCU shall accept separate phases on the constant hot and switched hot inputs.

The ELCU shall include high voltage input surge protection up to 50,000V.

Load contacts shall be able to withstand 10 direct shorts while connected to a 20 Amp breaker without permanent damage.

The ELCU shall not generate any objectionable electrical or mechanical noise.

The ELCU shall have UL 94-VO or UL 94-5VA flame rating and be approved for installation above the suspended ceiling.

Dimming Applications: The ELCU shall automatically illuminate connected emergency lighting to full brightness upon utility power interruption, regardless of dimmer or switch position or occupancy sensor state.

The ELCU shall be compatible with 2-wire, 3-wire, 0-10V, and DALI dimming systems and ballasts.

The same local room switch, dimmer, or lighting control shall dim both normal and emergency luminaires at the same level during normal operation.

WALL DIMMERS

General:

1. Compatible with the voltage of the circuit being controlled: 120V;
2. Compatible with the load being dimmed;
3. Linear full-range slide control;
4. Separate ON/OFF switch: single-pole, 3-way, or multiple-location operation as indicated on the drawings;
5. No derating required in multi-gang applications;
6. Polycarbonate construction;
7. Color to match receptacles and/or standard toggle switches.

Line-voltage LED Dimmer:

1. Forward or reverse phase dimming control as required for the application;

0-10 V Dimmers:

1. Ratings: 30 mA sink current;
2. Adjustable dial allows users to trim the low-end dimming range;

DEVICE PLATES AND BOX COVERS

Decorative Cover Plate: Ivory smooth thermoplastic nylon. Note requirement for red plates on emergency outlets and switches. Refer to plans for specific areas where brown or black devices/plates are required.

Weatherproof Cover: All receptacles installed in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug is inserted. Covers shall be gasketed metal with hinged “in-use” device covers, powder coat painted. Non-metallic covers are not allowed. Covers shall be latching type and shall be lockable. Covers shall be identified as “extra-duty” type per NEC 406.9(B)(1).

Damp Location Cover: All receptacles installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure that is weatherproof when the receptacle is covered (attachment plug not inserted and receptacle covers closed). Covers shall be gasketed metal with hinged device covers, powder coat painted. Non-metallic covers are not allowed.

Surface Cover Plate: Raised galvanized steel.

PART 3 - EXECUTION

INSTALLATION

See plans for device mounting heights.

Install wall switches with OFF position down.

Wall dimmers: de-rate ganged dimmers as instructed by manufacturer; do not use common neutral.

Install convenience receptacles with grounding pole on bottom.

Install box for information outlet at the same height as adjacent convenience receptacles. Locate boxes for information outlet as close as practical to duplex power outlet, approximately 2-inches apart.

Install box for telephone jack for wall telephone at 46-inches to center above finished floor.

Install specific-use receptacles at heights shown on Contract Drawings.
Install decorative plates on switch, receptacle, and blank outlets in finished areas.

Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

Install devices and wall plates flush and level.

Receptacles shall have a bonding conductor from grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

FIELD QUALITY CONTROL
Inspect each wiring device for defects.

Operate each wall switch and sensor with circuit energized, and verify proper operation.

Verify operation of each ELCU by turning off the normal power circuit breaker at the panelboard.

Verify that each receptacle device is energized.

Test each receptacle device for proper polarity.

Test each GFCI receptacle device for proper operation.

The City of Madison personnel reserve the right to be present at all tests.

OCCUPANCY SENSORS
Power packs used in return air plenum ceiling areas shall be installed in an approved enclosure or UL listed for return air plenum.

Provide a minimum of 4’ of coiled cable for ceiling-mounted sensors.

Occupancy sensors shall be installed at locations indicated on the manufacturer’s submittal layout drawings. Sensors shall be located to prevent false “ON” tripping of the lights.

Sensitivity Test: After the sensor has been energized for at least 15 minutes, walk to the middle of the room (if conference room) or sit at the normal desk position (if an office). Make no motion for 20 seconds. Move one arm up and down slowly. The test LED should blink.

Time Delay Test: Set the time delay for 10 minutes. Walk into the room to activate the sensor then leave room. Sensor must turn lights off at approximately 10 minutes. Walk into the room again to reactivate the lights. Lights should activate within 1 second.

For lights on emergency power *without* an emergency lighting control unit (ELCU), use the *emergency* circuit to energize the occupancy sensor’s power pack. Route the emergency circuit through the occupancy sensor’s power pack relay to the light fixtures. Route any non-emergency circuits controlled by the same occupancy sensor through separate auxiliary relay packs.

For lights on emergency power *with* an ELCU, route the *normal* power through the switches and occupancy sensor relay to the ELCU, then to the normal power lighting fixtures. Connect the emergency circuit to the ELCU’s emergency power terminals, then to the emergency lighting fixtures. The ELCU will control the emergency lighting along with the normal lighting controls, but will turn the emergency lights ON in a power outage, regardless of the position of the switches or relays.

ADJUSTING

Adjust devices and wall plates to be flush and level.

Mark all conductors with the panel and circuit number serving the device with a machine generated label, at the device, and on the back of the device cover.

END OF SECTION

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SECTION 262728
DISCONNECT SWITCHES

PART 1 - GENERAL

SCOPE

The work under this section includes disconnect switches, fuses and enclosures. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals
- Operation and Maintenance Data
- General

PART 2 - PRODUCTS
- Disconnect Switches
- Fuses

PART 3 - EXECUTION
- Installation

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 27 02 - Equipment Wiring Systems

REFERENCES

NECA (National Electrical Contractors Association) "Standard of Installation"
NEMA ICS 2 – Industrial Control Devices, Controllers, and Assemblies
NEMA KS 1 – Enclosed Switches
UL 50 – Enclosures for Electrical Equipment
UL 98 – Enclosed and Dead-front Switches

SUBMITTALS

Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

GENERAL

Provide disconnect switches for loads required by code. Review HVAC and Plumbing specifications to determine what equipment is furnished with disconnect switches. Install disconnect switches whether furnished under this contract or not. It is the Electrical Contractors responsibility to determine the need for a disconnect switch for each load. The contractors shall include in their bid the code required disconnect switches whether indicated on the drawings or not.

PART 2 - PRODUCTS

DISCONNECT SWITCHES

Fusible Switch Assemblies (use only when overcurrent protection is required): NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: designed to accommodate Class R, Class J or Class CC (motors) cartridge type fuses.

Nonfusible Switch Assemblies: NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

Enclosure:

Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.

Outdoors: NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.

Provide manufacturer's equipment ground kit in all disconnect switches.

In applications where the switch serves as the service entrance disconnect, provide service ground kit, label as service disconnect and provide UL listing for service disconnect.

FUSES

Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class RK 5. Interrupting Rating: 200,000 rms amperes.

Fuses 30 Amperes and less: Time-Delay, 600 volt, UL Class CC. Interrupting rating: 200,000 rms amperes.

Provide three (3) spares of each size and type fuse.

PART 3 - EXECUTION

INSTALLATION

Install disconnect switches where indicated on Drawings or required by NEC.

Provide identification as specified in Section 26 05 53.

Provide label on inside of disconnect cover identifying the type and size of fuse to be utilized.

END OF SECTION

SECTION 265113
INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

SCOPE

The work under this section includes interior luminaires and accessories, exit signs, and building-mounted exterior lighting. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Operation and Maintenance Data
- Extra Materials
- Definitions

PART 2 - PRODUCTS
- Interior Luminaires and Accessories
- LED Luminaires
- LED Drivers

PART 3 - EXECUTION
- Installation
- Adjusting and Cleaning
- Interface with Other Products
- Zero-to-10V Dimming Control Wiring Installation
- Field Quality Control
- Luminaire Connections

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 27 26 – Wiring Devices

REFERENCE STANDARDS

RoHS – Restriction of Hazardous Substances. Council of the European Union (EC) Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
LM-79-08 (or latest) – IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
LM-80-08 (or latest) – IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
TM-21-11 (or latest) – IES Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources.
NEMA SSL 1-2010 (or latest) – Electronic Drivers for LED Devices, Arrays, or Systems.

SUBMITTALS

Include outline drawings, lamp and ballast data, support points, weights, accessory information and performance data for each luminaire type.

For each luminaire type, submit luminaire information including catalog cuts with highlighted catalog numbers and required accessories:

- Luminaire:
  - Manufacturer and catalog number,
  - Type (identification) as indicated on the plans and schedule,
  - Delivered lumens,
  - Input watts,
  - Efficacy,

- Color rendering index.
- Driver:
  - Manufacturer and catalog number,
  - Type (Non-Dimming, Step-dimming, Continuous dimming, etc.),
  - Power Factor, Crest Factor, THD, etc.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

EXTRA MATERIALS

Provide three (3) percent of each lamp type, but not less than one (1) of each type.

Provide one (1) of each type of LED module, light bar, or array (if applicable). If the LED's are integrated into the luminaire and are not separate components, provide one (1) of each of these types of luminaires.

Provide one (1) LED driver or ballast of each type.

DEFINITIONS

Driver: The power supply used to power LED luminaires, modules, or arrays.

L70, $L_{70,}$ or $L_{70\%}$: The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LED's original light output. This test is being developed by the IES and is currently described by TM-21-11.

LED's: Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars or arrays, complete with driver.

LED luminaire failure: Negligible light output from more than 10 percent of the LED's constitutes luminaire failure.

PART 2 - PRODUCTS

INTERIOR LUMINAIRES AND ACCESSORIES

See the Luminaire Schedule on the drawings for type of luminaires and catalog numbers. Luminaires manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated luminaires, meet the intent of the design, and are approved by the A/E prior to bid.

Luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, or IEC).

Provide luminaires with quick-connect disconnecting means, similar to Thomas & Betts Sta-Kon.

LED LUMINAIRES

- LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
  - Minimum Light Output.
  - Zonal Lumen Requirements.
  - Minimum Luminaire Efficacy.
  - Minimum CRI.
  - L70 Lumen Maintenance.
  - Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

Additional requirements:

- Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).

- Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
- Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
- Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- Luminaire and driver shall be furnished from a single manufacturer to ensure compatibility.
- Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
- LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
- Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- All luminaires shall be provided with knockouts for conduit connections.
- The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
- Provide all of the following data on submittals:
    - Delivered lumens
    - Input watts
    - Efficacy
    - Color rendering index.

LED Luminaires used for Emergency Egress Lighting:

- The failure of one LED shall not affect the operation of the remaining LEDs.

Emergency LED Luminaire Compatibility with Inverters:

- Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.

LED DRIVERS

General:

- Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.
- Minimum Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
- Driver shall have a rated life of 50,000 hours, minimum.
- Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- Driver shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
- Provide all of the following data on submittals:
    - Input watts
    - Power Factor (pf)

- Crest Factor (cf) at full input power
- Total Harmonic Distortion (THD).

Dimming Drivers:

- LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.

- Continuous Dimming Drivers: LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire. Continuous Dimming Drivers shall use 0-10V control.

PART 3 - EXECUTION

INSTALLATION

Verify ceiling types with Architectural plans or with existing ceilings. Verify specified luminaires are compatible with specified ceiling type(s) prior to ordering luminaires.

Install in accordance with manufacturer's instructions.

Install suspended luminaires using aircraft cable, or pendants supported from swivel hangers. Heavy duty chain supports may be used where indicated on the luminaire schedule. Provide aircraft cable, pendants, or chain lengths required to suspend luminaire at indicated height. All aircraft cables or pendant supported luminaires shall have an independent support to structure at all cable or pendant support locations. When chain is used, tie-wrap the luminaire whip to the chain.

Support luminaires larger than 2 x 4 foot (600 x 1200 mm) size independent of ceiling framing.

Provide independent support for all luminaires over 50 lbs.

Locate ceiling luminaires as indicated on reflected ceiling plan.

Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

The Contractor shall install luminaire supports as required. Luminaire installations with luminaires supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all luminaires adequately, providing extra steel work for the support of luminaires if required. Any components necessary for mounting luminaires shall be provided by the Contractor. No plastic, composition or wood type anchors shall be used.

Install recessed luminaires to permit removal from below.

Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

Install code required hardware to secure recessed grid-supported luminaires in place.

Install wall mounted luminaires and exit signs at height as scheduled. Use pendants supported from swivel hangers in exposed ceiling/structure locations where necessary to mount exit signs at the specified height.

Install accessories furnished with each luminaire.

Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

Bond luminaires and metal accessories to branch circuit equipment grounding conductor.

Install specified lamps in each luminaire and exit sign.

Dimmed luminaire circuits shall have separate neutrals.

Dimmed LED luminaires shall have a positive OFF, which requires turning off the circuit to the luminaire so that the luminaires don't "glow" at the lowest dimmed setting. This shall be accomplished using a switch, relay, or some other means acceptable to A/E.

All lamps shall be delivered to the job in sealed cartons and protected from dirt and dust during storage on the project. Lamps shall be taken directly from the cartons and installed in the luminaire with special care so that they do not become dusty and are not soiled in the operation.

All new lamps shall be operational at the Substantial Completion of the project.

ADJUSTING AND CLEANING

Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

Aim and adjust luminaires as indicated on Drawings or as directed by the A/E.

Touch up luminaire finish at completion of work.

INTERFACE WITH OTHER PRODUCTS

Interface with air handling accessories furnished and installed under Division 23.

Provide controls as indicated on the plans. Refer to section 26 27 26 - Wiring Devices. Controls shall be compatible with the luminaires/ballasts/drivers being installed.

ZERO-TO-10V DIMMING CONTROL WIRING INSTALLATION

Zero-to-10V dimming control conductors are classified by the NEC as Class 2 conductors and shall be kept separate from line-voltage conductors per NEC 725.136(A). Matching the insulation rating of Conductors of Different Systems does not apply to Class 2 conductors per NEC 300.3(C)(1), Informational Note No.1.

Wall box dimmers will typically have two conduits: One conduit for line-voltage power, and one conduit or conduit stub for the 0-10V control wiring.

The 0-10V wiring may be routed in free air if:

- The room is approximately 900 sq.ft. or less,
- The 0-10V wiring stays within the room,
- The ceiling space is a non-plenum space, and
- All splices of 0-10V wiring are spliced in a box.
- The 0-10V wiring may be tie-wrapped to the outside of the luminaire fixture whip per NEC 300.11(B)(2). Tie-wraps shall be UL listed for UV resistance.

At each luminaire, separate openings (either manufactured knock-outs or punched openings) shall be used for the line-voltage power and the 0-10V wiring. The EC shall use an NM cable connector at the opening for the 0-10V wiring. Zero-to-10V conductors entering and within a luminaire enclosure shall maintain a minimum separation of 6 mm (0.25 in.) per NEC 725.136(D).

METAL-CLAD (MC) CABLE

Metal-Clad (MC) type cable that combines power and Class 2 circuits into a single cable may be used for the luminaire wiring within a single room. Examples of such products are Encore Wire® MC-LED™ or Southwire® MC-PCS Duo™. Manufacturer's names and catalog numbers are used for quality and performance only. MC Cables manufactured by others shall be equally acceptable provided they meet or exceed in performance and quality as specified.

FIELD QUALITY CONTROL

Operate each luminaire after installation and connection. Inspect for proper connection and operation.

LUMINAIRE CONNECTIONS

Recessed, including Master-Satellite connections:

- Use a luminaire fixture whip from a J-box for recessed lay-in luminaires. Luminaire fixture whips shall be aluminum or steel AC Cable (Armored Cable) or Flexible Metal Conduit (FMC).
- Cable/Conduit whips shall be 3/8" (10 mm) minimum diameter, six feet (1.8 m) maximum length.
- Flexible whips or pre-wired systems between master and satellite luminaires may be supported by the ceiling grid wires.
- The flexible connectors shall be steel, galvanized, clamp type with locknut, snap-in type with locknut, or snap-in connector type, including those used on the master-satellite units.

Chain or Cable Hung (unfinished spaces):

- Use manufacturer's SO cord or a luminaire fixture whip from a J-box. Luminaire fixture whips shall be aluminum or steel AC Cable (Armored Cable) or Flexible Metal Conduit (FMC).
- Conduit whips shall be 3/8" (10 mm) minimum diameter. Conduit whip or SO cord shall be cut to length (six feet (1.8 m) maximum) and shall allow movement of the chain/cable/luminaire, but shall not be long enough to "loop" and shall present a neat and workmanlike appearance.
- Luminaire field wired flexible cord installations shall be connected per NEC 410.62.
- The flexible connectors shall be steel, galvanized, clamp type with locknut, snap-in type with locknut, or snap-in connector type, including those used on the master-satellite units.
- Conduit whip slack shall be tie-wrapped to the chain supports. Tie-wraps shall be UL listed for UV resistance.

Cable Hung (finished spaces):

- Use manufacturer's SO cord from luminaire to a J-box.
- SO cord shall be cut to length (six feet (1.8 m) maximum) and shall allow movement of the cable/luminaire, but shall not be long enough to "loop" and shall present a neat and workmanlike appearance.
- SO cord slack may be tie-wrapped to the cable supports. Tie-wraps shall be UL listed for UV resistance.
- Luminaire field wired flexible cord installations shall be connected per NEC 410.62.

Surface Mounted (unfinished spaces):

- Provide direct conduit and box connection.

Surface Mounted (finished spaces):

- Provide direct conduit and box connection. Use surface metal raceway where indicated on drawings. Conceal box and conduit where appropriate. Flexible metal conduit shall not be used where it is exposed.

END OF SECTION

SECTION 27 00 05
COMMUNICATIONS CABLING

PART 1 – GENERAL

1.1. SCOPE OF WORK

A. This section specifies the City of Madison requirements for product design, performance, quality assurance, and contractor responsibilities for the execution of work to install a complete Category 6 (CAT6) structured cabling system.

B. Execution of work includes but is not limited to the delivery and storage of materials, preparation, installation, field testing, and project completion tasks.

C. System certification and warranty requirements for completed work and future moves, adds, and changes (MACs) are also specified in the section.

1.2. RELATED SPECIFICATIONS

A. Section 01 33 23 Submittals

B. Section 27 21 33 Wireless Access Points (WAP)

1.3. CONTRACTOR QUALIFICATIONS

A. The Contractor shall have experience in the installation and testing of similar systems a specified in the plans and specifications for this contract.

1. The Contractor shall have completed at least 2 projects of similar size and scope within the last 24 months.
2. The contractor shall provide references upon request. Information to provide shall include project name, address, date of installation, client name, title, telephone number, and project description.

B. The Contractor shall be certified by the connectivity manufacturer to install, service and warranty the specified product from the time of bidding through the duration of the contract installation and warranty period.

D. The Contractor must maintain a State Contractors License as required by the State of Wisconsin.

E. All members of the Contractors installation team must be certified by the manufacturer as having completed the necessary training to complete their part of the installation. All personnel shall be adequately trained in the use of tools and equipment required for the complete installation.
F. The Contractor shall own and maintain tools, installation equipment, and testing equipment necessary for the successful installation and testing of Optical and Category 5E, 6, and 6A premise distribution systems.
G. The Owners reserves the right to require the Contractor to remove from the project any such employee the Owner deems to be incompetent, careless, or insubordinate.

1.4. DRAWINGS AND INSPECTION OF THE SITE

A. The Communication (Technical) floor plan drawings are in PDF format, are not typically dimensioned, and should not be scaled. The contractor should refer to the Architectural sheets and construction details for dimensions.
B. The Contractor shall review all site conditions prior to submitting a bid for this project. Any obvious discrepancies between site conditions and the bidding documents shall be brought to the attention of the Architect/Engineer immediately so clarification can be made to the bidding documents by addendum.
C. Any existing wires, utilities, or equipment shown on the drawings as existing are for general information and to the best knowledge of the Architect/Engineer. The contractor shall field verify all existing conditions.
D. The contractor shall field verify distances and equipment placements, and coordinate all installation locations with other trades, construction managers and the general contractor prior to installation.
E. Change order requests for additional material or labor costs due to the contractors lack of knowledge of existing field conditions will not be allowed.

1.5. SUBMITTALS

A. The Contractor shall review Section 01 33 23 Submittals for additional information.
B. The Contractor shall provide a complete submittal package prior to ordering equipment and materials. Partial submittals will not be considered. A complete submittal shall include but not be limited to the following:
    1. Manufacturers data (specifications, “Cut Sheets”)
    2. Wiring diagrams for all installed cabling
    3. Equipment rack and cabinet layouts
    4. List of cabling distances (typical and maximum) for all structured cabling
B. The Contractor shall provide all license and certification documents for the project manager and all project technicians as part of the product submittal. All documents shall be valid through the completion of the installation and warranty period. Documents shall include but not be limited to the following:
    1. State of Wisconsin Contractors license
    2. Structured cabling and termination equipment installation certifications for:
        a. Copper
        b. Optical Fiber Connectivity
        c. Cabling
C. Product submittals are required for sole source products.
D. Product submittals are not required for Owner provided equipment and materials. However miscellaneous materials required for a complete installation of Owner provided equipment may be necessary.
E. Work shall not proceed until all submittal items have been approved.

1.6. PRODUCT SUBSTITUTIONS

A. The Contractor shall thoroughly review all specifications associated with the Division 27 installations for product specific information.
B. Substitutions for sole sourced products will not be permitted.
C. Substitutions for items to be considered as equals shall be submitted for review at the time of bidding in accordance with the bidding instructions. Approved substitutions will be identified by a written addendum to the bidding documents prior to the end of bidding. Only items in the approved addendum will be allowed as substitutions.

1.7. TESTING

A. Prior to testing, provide a summary of the proposed test plan for each cable type including equipment to be used, set-up, test frequencies or wavelengths, results format, etc. Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

PART 2 - PRODUCTS

2.1. GENERAL

A. This section indicates pre-approved product manufacturers, specific products, or minimum product performances. Substitutions/alternates to this information shall only be allowed as described in paragraph 1.7 above.

B. The manufacturer of the connectivity products specified in this document as required for construction of the cabling infrastructure shall be:
   1. Hubbell Premise Wiring

C. The manufacturer of the cabling products specified in this document as required for construction of the copper cable infrastructure shall be:
   1. Mohawk Cable

D. The manufacturer of the fiber optic cabling products specified in this document as required for construction of the fiber optic cable shall be:
   1. Mohawk Cable
   2. Pre-approved equal

2.2. WORK AREA CONNECTORS

A. Category 6 Jacks
   1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
   2. Jacks shall be designed for 4-pair, 100 Ohm balanced un-shielded twisted pair (UTP) cable.
   3. Jacks shall terminate 26-22 AWG solid or stranded conductors.
   4. Jacks shall include a dust cap for wire retention.
   5. Jacks shall accept FCC compliant 6-position plugs.
   6. Jacks shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.
   7. CAT6 jacks shall be backward compatible with existing category 3, 5, and 5E cabling systems for fit, form and function.
   8. Jacks shall be manufactured in the USA.
   9. CAT6 jacks shall meet or exceed CAT6 transmission requirements for connecting hardware as specified in ANSI/TIA/EIA-568-C-2 transmission performance specifications for 4-pair 100 ohm.
   10. Jacks shall be UL listed and CSA certified.
   11. Colors shall be specified by the Owner.
   12. CAT6 modular jacks shall be:
      a. Hubbell
         i. HXJ6EI (Category 6 – Ivory)

2.3. FACE PLATES

A. All faceplates shall meet the following specifications
   1. Faceplates shall UL listed, CSA certified, and shall be constructed of high impact UL94 V-0 rated thermoplastic.
   2. Faceplates shall be compatible with standard NEMA openings and boxes.
      a. Faceplates for single gang boxes shall be 2.75” W x 4.5” H (69.8 mm x 114.3 mm).
      b. Faceplates for double gang boxes shall be 4.5” W x 4.5” H (114.3 mm x 114.3 mm).
      c. Mounting screws shall #6-32 pan head Phillips/slotted and color matched to the faceplate.
   3. Port size in each faceplate shall fit the CAT6 modular jack or snap-fit fiber optic, audio, and video modules for multi-media applications.
   4. Faceplates shall be rear loading with a designation window.
   5. Faceplates shall be provided with clear plastic and color matched label field covers, and shall provide ANSI/TIA/EIA-606-A compliant workstation outlet labeling.
   6. Work area faceplates shall be
      a. Hubbell (IFP series)
         i. IFP14EI (4-port Ivory)

2.4. CABLE

A. Category 6 UTP
   1. Plenum cable construction shall be four twisted pairs of 23AWG insulated solid conductors with a ripcord surrounded by a tight outer jacket.

2. Non-plenum cable construction shall be four twisted pairs of 23AWG insulated solid conductors with a ripcord surrounded by a tight outer jacket.
3. No minimum compliant cable will be accepted, this facility requires additional band width.
4. The ripcord shall be directly underneath the outer jacket.
5. Cable shall be marked with the manufacturer and pertinent information. UL, ETL, or CSA agency certification or verification markings shall be on the cable jacket according to the certifying agency's requirements.
6. Color coding of pairs shall be as follows:
    a. Pair 1: white/blue; blue
    b. Pair 2: white/orange; orange
    c. Pair 3: white/green; green
    d. Pair 4: white/brown; brown
7. Plenum or riser rated jackets
8. Cable shall be supplied in 1000 foot spools or 1000 foot Reelex boxes.
9. Cable shall exceed CAT6 transmission requirements specified in ANSI/TIA/EIA-568-C-2.
10. Cable shall be UL and C(UL) listed.
11. Cable shall exceed the requirements of TIA/TSB-155, 10 GB/S Ethernet operation over 37 meters channel length.
12. CAT6 UTP horizontal distribution cable as specified in the contract documents shall be
    a. Mohawk Advancenet Cable
        i. Plenum M57193
        ii. Riser M57202

B. Backbone distribution cable – Fiber Optic
1. Single-mode fiber backbone distribution cable shall be available with multi-strand construction for intra-building applications.
2. OFNR or OFNP will be determined at each site. The contractor shall be responsible to assure that the proper type of jacketing is being used. Failure to meet local code will cause the replacement of at no expense to the Owner.
3. Single-mode fiber shall be dispersion un-shifted fiber in compliance with ANSI/TIA/EIA-492 CAAA.
4. Intra-building fiber distribution cable design shall be according to ANSI/ICEA S-83-596.
5. Single-mode backbone fiber distribution cable, when installed, shall exceed the performance requirements of ANSI/TIA/EIA-568-C-3.
6. Single-mode optical fiber distribution cable shall be:
    a. Mohawk Cable (basis of design)
        i. Single-mode riser M9W042 (12 strand), unless otherwise specified by the Owner.
        ii. Single-mode plenum M9W048 (12 strand), unless otherwise specified by the Owner.
    b. Pre-approved equal.

2.5. CONNECTORS – FIBER OPTIC

A. Pre-polished fiber connector basic design shall be a factory pre-polished LC-style optical fiber connector with a zirconium ceramic ferrule.
B. Index-matching gel is factory injected into the cleaved fiber stub splice to minimize connector insertion loss.
C. LC single-mode factory pre-polished connectors shall have pre-installed fibers.
D. Connector materials shall be designed with thermal stability to comply with environmental requirements of ANSI/TIA/EIA-563-B.3 and Telcordia GR-1081-CORE.
E. Pre-polished LC connectors shall require no field polishing and require no adhesives for termination.
F. Connector design and termination technique shall be independent of cable type or manufacturer, and shall be compatible for either 900 micron buffer or 250 micron buffer distribution cables.
G. Pre-polished LC fiber connectors when properly installed onto qualified cable shall meet the 10GB/S Ethernet performance requirements of IEEE802.3.
H. LC fiber connectors when properly installed onto qualified cable shall exceed the mechanical and environmental performance requirements of ANSI/TIA/EIA-568-C-3.
I. Multi-mode optical fiber horizontal distribution cable shall be:
1. Hubbell (Prolick)
    a. Single-mode LC – FCLC900KSM12
2. AFL (Fast)
    a. Single-mode LC – FAST-LC-SM

2.6. PATCH PANELS – CATEGORY 6

A. CAT6 patch panels shall be standard 8-position, RJ-45 style, un-keyed, FCC-compliant receptacle in 24 and 48 port configurations.
B. Panel frames shall be black powder coated 14 gauge steel with rolled edges on top and bottom for proper stiffness.
C. Panels shall accommodate a minimum of 24 ports for each rack mount unit (1 RMU=1.75 inches). 48 ports are recommended.
D. Panels shall be designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable.
E. Panels shall terminate 26-22 AWG solid connectors
F. Panels shall have individual port identification numbers on the front and rear of the panel. Panels shall have the CAT6 designation visible from the front when installed.
G. Printed circuit boards shall be fully enclosed front and rear for physical protection.
H. Panel contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
I. Panel termination method shall follow the industry standard 110 IDC punch-down using a standard 110 impact termination tool.
J. CAT6 panels shall be backward compatible with existing category 3, 5, and 5E cabling systems for fit, form, and function.
K. CAT6 patch panels when installed shall exceed the link or channel performance requirements of ANSI/TIA/EIA-568-C.2.
L. CAT6 patch panels shall be able to accommodate 10G in a 37 meter channel per TSB-155.
M. CAT6 patch panels shall be:
    1. Hubbell (Nextspeed 6 series)
        a. 24 port – P6E24U
        b. 48 port – P6E48U

2.7. RACKS – FREE STANDING – 2 POST

A. Rack material shall be structural aluminum with durable black polyurethane powder coat finish.
B. Installed racks shall have a static load capacity of 500 lbs.
C. Racks shall be available in either 19 inch or 23 inch standard rack configurations
D. Tapped holes in the vertical rails for mounting of panels shall be #12-24 thread size. Coating shall not interfere with the thread fit.
E. The standard rack height shall be 7 feet (84 inches) and have a capacity of 45RMU.
F. Rack base angles shall be pre-drilled for floor mounting and for assembly to vertical rails.
G. Racks shall accommodate expansion of cable capacity and added volume for CAT6 cabling.
H. Free standing racks and accessories shall be:
    1. Hubbell (Nextframe series)
        a. HPW84RR19
I. *NOTE:* Each basic rack delivered shall consist of equipment rack, isolation pads, 18” wide black ladder rack and mounts to secure to the rack, a vertical electrical 20 amp outlet strip (minimum of 6 duplex receptacles) with mounting brackets.

2.8. CABLE MANAGEMENT – VERTICAL

A. Vertical jumper management shall provide for cable routing on front and rear of each rack and be 3½" square (minimum). Vertical Jumper Management hardware shall mount on spacers attached to the rack uprights and not on the upright itself. Where multiple racks are to be installed, this hardware shall be mounted between the uprights of adjacent racks. Rack uprights and the spacers shall be secured together per manufacturer recommendations.
B. Rack shall be equipped with Vertical Jumper Management Hardware as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment.
C. Hardware shall provide for cable routing on front and rear of each rack.
D. Vertical managers shall:
    1. Have non-metallic fingers spaced no greater than and aligned with each Rack Unit indicator on the equipment rack.
    2. Be equipped with hinged front and rear doors that cover the cable routing area.
E. Channel dimensions: Minimum width: 6” at end-of-row, 8” between adjacent racks or as shown on project drawings.
F. Hardware shall be designed to mount on spacers attached to the rack uprights and not on the upright itself.

1. Where multiple racks are to be installed, mount hardware between the uprights of adjacent racks.
2. Secure rack uprights and spacers together per manufacturer recommendations.

G. Cabinet(s) shall be equipped with vertical and horizontal cable management hardware, in the form of rings and guides, as to allow an orderly routing of optical fiber and twisted pair jumpers from the patch panel to the customer provided network equipment.

2.9. CABLE MANAGEMENT - HORIZONTAL

A. Provide horizontal cable management hardware adjacent to (above or below) each row of jacks in a Modular Patch Panel.

B. Equipment Rack shall be equipped with Horizontal Jumper Management Hardware as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment.

C. Horizontal Jumper management hardware shall be:
1. A 2 RU (3.5”), plastic or painted steel panel.
2. Configured with a minimum of five (5) Jumper distribution rings (1.75" x 3.75" minimum dimension).

D. Cabinet(s) shall be equipped with vertical and horizontal cable management hardware, in the form of rings and guides, as to allow an orderly routing of optical fiber and twisted pair jumpers from the patch panel to the customer provided network equipment. At a minimum, provide one such horizontal jumper management panel with each cabinet.

2.10. INNER - DUCT

A. Fiber optic cable shall be installed with inner-duct for protection of fiber cables in a shared pathway.

B. Inner-duct shall be rated for the plenum or riser environment that it is being installed in.

C. Three inner-ducts shall be run between closets. One for current installation and two spare for future applications.

D. Size: 1” corrugated

E. Flexible and light weight

F. Pre-threaded with pull line.

PART 3 - EXECUTION

3.1. GENERAL

A. Refer to Project Drawings which indicate Equipment Outlet locations, major cable routes and termination location(s) within each building. Coordinate duct allocation with the Agency.

B. Furnish and install all cables, connectors, hardware and equipment as shown on drawings and as specified above.

C. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

D. The contractor will be responsible for identifying and reporting to the City of Madison Construction Representative any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

E. Where unacceptable conditions are found, bring this to the attention of the City of Madison Construction Representative immediately. A written resolution will follow to determine the appropriate action to be taken.

F. Beginning installation means contractor accepts existing conditions.

G. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings with the respect or regard to the quality, value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

H. All cables, termination components and support hardware shall be furnished, installed, tested and documented by the Contractor unless noted otherwise

3.2. DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be stored in a clean, dry, and secured area, preferably indoors and shall not interfere with other construction activity.

B. Storage temperature shall adhere to the manufacturers recommendations.

C. Handling of any materials packaged or un-packaged shall be in such a manner as to avoid damage to the item.
D. Installation of CAT6 cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature shall above 50 f is recommended.

3.3. PREPARATION

A. Cable Pathways and Firestops
1. Cable pathways including but not limited to conduit, cable trays, ladder racks, raceway, slots, sleeves, etc. shall be located and mounted according to the contract drawings and manufacturers installation instructions. Pathways shall not be installed in wet areas.
2. Cable pathway fill ration, bend radius , run length, number of bends, and proximity to EMI sources shall be in accordance with ANSI/TIA/EIA-569-B. Maximum cable count of the initial installation shall not exceed 40% fill ration in any one pathway.
3. In accordance with NEC 2005 power wiring and communications cabling shall not share the same pathway or outlet unless separated by a physical barrier.
4. Cable pathways shall be secured to a structural member of the building or permanent wall studs. Wall surfaces for raceway mounting should be finished complete.
5. Metallic pathways shall be electrically continuous, free of sharp edges, and properly bonded to an approved ground. EMI sources such as ballasts, motors, and bus conductors shall be avoided by using proper separation distances.
6. Pathways that penetrate fire-rated barriers shall be fire stopped according to local codes and recognized practices. Fire stop materials or devices shall be qualified to UL-1479 in accordance with ASTM E814. Fire stop method shall have the Architect/PE approval.
7. Core drilling of holes for fire-rated poke through outlet devices shall have approval of the structural engineer or PE on the contract drawings prior to starting the work.
8. Pathways for vertical cable runs such as slots and sleeves shall be installed in the proper location in accordance to applicable codes and standards.

B. Telecommunication Rooms and Equipment Rooms
1. Telecommunication Room (TR) layout and location shall be in accordance with the guidelines of ANSI/TIA/EIA-569-B. TR's shall not be installed in wet areas, near EMI sources, or caustic chemicals.
2. Layouts of rack, cabinet, or enclosure locations shall be according to the approved submittal drawings.
3. Racks and cabinets shall be secured to the floor suing proper anchors and fasteners.
4. Mount and assemble racks, cabinets, brackets, and enclosures per the manufacturer's installation instructions. Mount patch panels and cable management accessories in the specified sections.
5. Adjoining pathways (ladder rack, cable tray, etc.) shall be properly secured and positioned to allow adequate bend radius of cables entering the rack or cabinet.

C. Wall outlets and recessed wall boxes
1. Wall outlet and cable drop pathway location shall be according to contract drawings. Guidelines from ANSI/TIA/EIA -569-B should be followed for location with electrical outlets, and outlet height above finished floor.
2. Outlet boxes shall be fastened securely to a wall stud or structural element in a manner that permits flush mounting of the faceplate with the finished wall.
3. Multi-connect boxes shall be installed in a manner to comply with separation rules for power and communications wiring in close proximity.
4. Refer to specific manufacturer's recommendations for wall outlet selection, cable deployment, and termination of jacks into faceplates.

D. Surface housings and MUTOA outlets
1. Raceway or conduit should be deployed to the surface housing location for through wall cable entry. Cut the wall opening to match the location in the housing base.
2. Layout mounting holes onto the desired wall location. For wallboard, concrete, or cinder block walls drill to the proper depth and install anchors.
3. Always use the appropriate wall anchors for the wall material being anchored to. Installing mounting screws without using anchors will not be permitted. Mounting to studs is preferred.
4. Mount base plate or surface box or MUTOA to outlet location using the proper fasteners. Note: furniture and wall outlet applications require mounting of the base plate prior to cable pulling and connector termination.
5. Install cover and base plates.

6. Refer to detailed manufacturer's guidelines for cable deployment and termination of jacks into surface housings. Due to the larger size of CAT6 cables proper cable bend radius must be maintained. Certain restrictions may apply when dressing CAT6 cabling in to surface housings.

3.4. INSTALLATION

A. Cable Support

1. The contractor shall install all supports for cables specified in this section. Traditional ladder rack shall be used in each Telecommunication Room. Basket and J-hooks shall be used for horizontal cable support.
2. Cable supports shall be spaced randomly but no further than 5'-0"apart.
3. Inner-ducts shall be run between each wiring closet or Telecommunications Room. One shall be for current installation with three multi-cells for future installations or changes. In each Telecommunications Room the inner-ducts entering the space will be combined in a size appropriate metallic box that is mounted on the wall. The combined inner-ducts will then be routed to the rack and the fiber bay.
4. The Contractor shall provide all incidental cable management products required for a complete and neat cabling installation. Incidental products include but are not limited to sleeves or conduit raceways required to protect exposed cabling.
5. A horizontal conduit system consists of conduits radiating from the telecommunications Room to the workstation outlets in the floor, walls, ceilings, and columns of the building. When using a conduit distribution system utilize the most direct route following the building lines.
6. The size and number of conduits or sleeves used for backbone pathways depends on the usable floor space served by the backbone system. At least three 4 trade size sleeves are recommended.
7. Conduit is only required if building codes or environmental conditions require it. Rigid or EMT metal conduits are suitable for building installation. Adequate planning should allow for a minimum of 1-inch conduits to each workstation location if code requires conduit for voice and data cables.
8. Conduit fill ratios shall not exceed 40%. Contact the cable manufacturer to get recommendations on fill rates.
9. No conduit run should be designed with more than two (2)-90 degree bends between pull points or pull boxes. If a run requires more than two (2)-90 degree bends install a pull box.
    a. Exceptions to this shall be as follows:
        i. The total run is not longer than 33 feet.
        ii. The conduit size is increased to the next trade size larger.
        iii. One of the bends is located within 12 inches of the cable feed end (this exception only applies to placing operations where cable is pushed around the first bend).
10. All conduits shall be equipped with a contiguous length of plastic or nylon pull string with a minimum rating of 200 lbs (90 Kg).
11. A conduit run shall not be designed with continuous closed sections longer than 100 feet without pull points or pull boxes installed.
12. All conduits should terminate above on in the installed ladder racks and allow for proper cable racking. Cable materials should be considered in areas that have excessive distance between the conduit and ladder rack.
13. Trays and conduits located within the ceiling shall protrude into the room a distance of 1 to 2 inches without a bend and at least 8 feet above finished floor. Clear unobstructed access to the ladder rack and conduits shall be provided within Telecommunications Rooms.
14. Conduits entering through the floor shall terminate at least two (2) inches above the finished floor.
15. Locate slot/sleeve systems in places where pulling and termination will provide the easiest access.
16. If possible locate sleeves, slots, and/or conduits on the left side of the room. This placement enhances the use of wall space from left to right.
17. When possible entrance conduit and distribution conduit/cable tray should enter/exit on the same wall. If this is not possible provide and install ladder rack inside the room for distribution from wall to wall.
18. All floor penetrations shall be core drilled with a maximum of 1/4 inch size greater than the exterior diameter of the riser conduit.
19. Conduits entering through a wall shall be reamed, bushed, and terminated as close as practicable to the terminating rack or wall.
20. Terminations above the suspended ceiling shall terminate no less than 3 inches above the finished ceiling and shall be finished with a bush opening.
21. All conduit shall be labeled for easy identification.
22. All floor penetrations shall be at columns, exterior walls, or in equipment rooms.

23. Cables shall be supported at the height of the bottom flange of structural beams using a rigid support method (I.E. threaded rod, beam clamps, etc.)
24. Do not support cables from duct work, sprinkler piping, water piping, waste/vent piping, conduit, ceiling wire, or other support systems.
25. The conduits or sleeve will be installed per TIA/EIA-569-B and shall have all penetrations sealed with an approved fire stop product.
26. Provide independent support systems for each low voltage cabling system.

B. Cable

1. CAT6 cable will be run for data. CAT6 gel filled cable will be run in the backbone for all communications applications. Certain environments may require the use of different cables and/or cable jackets.
2. All terminations shall utilize T568B wiring. The Contractor shall be responsible for removing/replacing any wiring that is not in compliance with this requirement at no additional cost to the owner.
3. Maximum cable lengths to be 295 feet (90 m) including the service loop. Provide all necessary installation materials, tools, and equipment to perform insulation displacement type terminations at all communications outlets and patch panels.
4. All communication cabling that has become abandoned as part of new renovation, previous renovation, or used as temporary communication cables during the construction process shall be completely removed.
5. Refer to detailed manufacturers guidelines for deployment of CAT6 cable. Certain restrictions apply and specific techniques are recommended.
6. All cabling shall be installed in accordance with the manufacturers written bend radius and pulling tensions. General industry guidelines recommend the following:
   A. Tensile loading of a single 4-pair copper UTP cable shall not exceed 25 LBF
   B. Bend radius of a single 4-pair copper UTP cable shall not exceed 4 times the diameter of the cable.
   C. Bend radius of multi-pair copper UTP and optical fiber cable shall not exceed 10 times the diameter of the cable.
7. All conduits and conduit sleeve shall have bushings or grommets installed prior to the installation of communications cables to avoid damage and abrasions to the cable sheathing and insulation. If bushings are installed by the electrical contractor the communications cabling contractor shall furnish and install bushings prior to pulling communications cabling.
8. Horizontal cable length for 4-pair copper UTP cables shall not exceed 295 feet. The contractor is responsible for reviewing the plans and specifications prior to bidding and installation and shall notify the Communications Design Engineer of cable runs that may exceed 295 feet.
9. Splices shall not be permitted in any voice or data cable unless otherwise specified or shown on the drawings.
10. Copper cables shall not be placed near sources of extreme heat (I.E. boilers, radiators, heat coils, etc.).
11. Maintain cable twists for all UTP cables. For terminations, cable sheathing shall be stripped back no more than 1/2 inch from the termination point for all CAT6 cables.
12. All cables shall be supported by cable tray, cable runway, or J-hooks. When large quantities of cables leave trays or runways, cables shall be supported by drop-outs or cable support hardware manufactured specifically for the purpose of supporting cables. J-hooks shall be installed a minimum of every 5 feet and cabling shall maintain minimal deflection and strain (less than 12” deflection). Cables shall not be supported from ceiling grid wires. Cables shall not run above steel joists.
13. All cables shall be separated and bundled into like groups.
14. Service loops shall be provided at both ends of installed horizontal and backbone cabling. A 12” service loop shall be installed in the ceiling space near workstation outlets (excessive cable shall not be coiled in outlet boxes). A 10 foot service loop shall be provided in Telecommunication rooms and shall be installed to allow for future equipment rack/cabinet relocations without the need to re-terminate patch panels. The 10 foot service loop shall be neatly bundled and secured in the ceiling space with large D-rings or placed in cable trays. Cable slack and service coils shall be stored properly above the ceiling or under the access floor. A “figure-eight” service loop is recommended for CAT6 cabling to reduce EMI coupling. Loose random bundling is recommended.
15. Any cabling installed in equipment rooms shall be neatly placed in cabling trays, cabling runways, or horizontal and vertical rack/cabinet cable management devices.
16. Only Velcro straps shall be utilized for cable bundling. Tie wraps, zip ties, and other such rigid devices will not be permitted when bundling cables.
17. Maintain the following separation distances between cables, other system cables, and other building systems:

a. One (1) foot from fluorescent lights
b. One (1) foot from power cables in parallel
c. One (1) foot from electrical conduits or other system cables and electrical equipment
d. Four (4) feet from motors and transformers
e. Three (3) feet from hot water piping and other mechanical equipment
f. Ten (10) feet from bus conductors or high current branch circuits
g. All low voltage cables shall be run parallel or at right angles to building structural framework. Do not run cables diagonally across ceiling space without written authorizations by the Communications design Engineer or the Owners Representative.
h. Communications cabling that must cross power cables or conduit shall cross at a 90 degree angle and shall not make physical contact.

18. Fire seal around all cables running through rated floors and walls. Firestop all cables and pathways that penetrate fire-rated barriers using approved methods, materials and in accordance with all local codes.
19. Contractor shall install a spare pull string with every outlet installed.
20. Do not install cable in wet areas, or in proximity to hot water pipes and boilers.
21. Termination ends of cables shall be clean and free from crush marks, cuts, or kinks left from pulling operations. Installed cable jackets shall have no abrasions with exposed conductor insulation or bare copper “shiners”. The contractor shall be responsible for replacing any damaged cables.
22. Backbone cables shall be installed and bundled separately from horizontal distribution cables. Backbone and horizontal cable bundles shall be loose and random.
23. Back bone cables spanning more than three floors shall be supported at the top of the cable run with wire mesh grip and on alternating floors unless otherwise specified by local codes or manufacturers guidelines.
24. Vertical runs of backbone cables entering each Telecommunications Room shall be securely fastened along a properly prepared wall in the room on each floor. Use of cable ladders is required.

C. Communications Infrastructure
1. Maximum cable lengths shall be 295 feet (90 m) including the service loop. Provide all necessary installation materials, tools and equipment.
2. Support and secure cables at patch panel using rear able management bracket, spools or management devise.
3. Cross-connects shall be completed as per the construction schedule.

D. Optical Fiber Cable
1. Inner-ducts of the proper rating shall be run between each closet.
2. Cables for direct burial, aerial, or other outside applications shall be designed specifically for the intended purpose.
3. All optical fiber shall be installed using open cabling methods. Limit cable-bending radius to 20 times the cable diameter during installation and 10 times the cable diameter after installation. Provide all required tools, materials, consumables, and equipment necessary for field mounting of LC connectors.
4. Do not exceed the maximum pull tension specified by the cable manufacturer. Use appropriate lubricants as required to reduce pulling friction. Avoid kinking and twisting of cables during installation.
5. Label both ends of each cable as to source and destination. Terminate optical fibers in a consistent and consecutive manner at each end. Place all material in inner-duct between label optical fiber raceway cable with yellow “CAUTION-OPTICAL FIBER CABLE” tags every 10 feet. Leave 10 feet of slack at each fiber termination point. Neatly coil slack optical fiber cable on top of rack above optical fiber patch panel enclosure at each rack location.
6. Optical fiber cable terminations shall utilize enclosures and components in quantities consistent with the required fiber counts at each end of each segment.
7. The contractor shall follow all of the connector manufacturer’s recommendations and shall visually inspect all optical fiber connector terminations with a 200 or 400 power microscope for proper termination.
   a. an acceptable termination shall show a connector tip that is free of imperfections in 100% of the core and 80% of the cladding.
   b. Unacceptable termination flaws shall include but not be limited to; scratches, full or partial cracks, bubbles, pits, epoxy residue, dirt, dust, oil, moisture, grinding, and sanding debris.
   c. All unacceptable connectors shall be re-terminated and re-inspected at the contractor’s expense.
8. During installation of optical fiber cable do not allow pulling tension to exceed cable manufacturer’s specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.

9. Clean all optical fiber connector tips prior to inserting them into matting receptacles or bulkheads. Install all dust covers.
10. Using approved methods, pull cable into conduit, place into raceway, or place into cable tray as specified. A pull cord (Nylon 1/8" minimum) shall be co-installed with all cable installed in any conduit.
11. Where cables are installed in an air return plenum riser rated cable shall be installed in metallic conduit.
12. Backbone and horizontal cables shall be installed and bundled separately in any pathway.
13. Cables above ceilings or below access floors shall be installed in cable trays or open-top cable hangers.
14. A service coil of at least 3 feet (1 m) is recommended within workstation outlets. At least 6 feet (2 m) is recommended for telecommunication enclosures. Main trunk and OSP cables shall also have a large diameter service coil in the specified location.
15. The recommended maximum spacing of cable supports above the ceiling is 5 feet.
16. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
17. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other approved structure to support the weight of the cable. Do not exceed maximum cable vertical rise limits.
18. Cables that are damaged during installation shall be replaced by the contractor.

E. Racks and Enclosures
1. Freestanding equipment racks and enclosures shall be protected of all dust, debris, and other environmental elements during construction until the punch list walk through.
2. Each rack or enclosure shall have a dedicated #6 AWG ground wire to a grounding busbar or building ground as defined by the NEC.
3. Secure racks and enclosures to the floor using the manufacturers rack installation kit.

F. Category 6 Jacks
1. Refer to specific manufacturer's guidelines for termination of jacks and dressing CAT6 cables inside wall outlets and surface housings. Due to the larger size of CAT6 cable service coils in outlet boxes and surface housings are not recommended.
2. Terminate all jacks according to manufacturer's instructions.
3. All jacks shall be wired using T568B.
4. The contractor shall maintain wiring pair twists as close as possible to the point of termination to assure 10G Base-T performance. Minimize the length of exposed pairs from the jacket to the IDC termination point during installation.
5. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13mm).
6. Jacks shall be properly mounted in plates, frames, or housings with dust caps fully installed over IDC contacts.
7. Horizontal cables extending from mounted jacks shall maintain a minimum bend radius of at least 4 times the cable diameter unless space is restricted. Note: refer to specific manufacturers recommendations for restricted cable bend radius.
8. Cable terminations shall minimize tensile or bending strain on the IDC contacts after assembly of the faceplate or housing to the wall outlet.

G. Category 6 Patch Panels
1. Properly mount patch panels into the designated rack, cabinet, or bracket locations with the #12-24 screws provided
2. Terminate cables behind the patch panel according to the manufacturer's installation instructions.
3. To insure proper performance the contractor shall maintain wiring pair twists as close as possible to the point of termination and minimize the length of exposed pairs from the jacket to the ICD termination point during installation.
4. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13 mm) and shall be kept to a minimum.
5. Each terminated and dressed cable shall be maintained perpendicular to the rear cover using the recommended cable management hardware.
6. Horizontal or backbone cables extending from the rear panel terminations shall maintain a minimum bend radius of at least 4 times the cable diameter.
7. Cable terminations shall have a minimal tensile or bending strain on panel IDC contacts in each installed location.
8. Panels shall be properly labeled on the front and back with the cable number and port connections for each port.

H. Harsh Environment Housing and Connectivity

1. Mount connector housing from the front of the device. Install gasket or optional protective cap before mounting connector housing into device.
2. Secure connector housing to device using supplied plastic nut. Tighten nut with 6-7 inch/pounds of torque.
3. Ensure that mounting surface is clean and free of debris.
4. Installing the jack into the mounted connector housing.
5. Install the terminated jack into the mounted connector housing by tilting the jack and securing the fixed latch in the connector opening. Rotate the jack securing the spring latch.
6. Clean and remove any obstructions from the surface that the wall plate assembly will be installed against.
7. Place washers provided with hi-impact series plates onto screws. Align rubber gasket on the back side of plate prior to installing to the box/wall by placing screws through plate and rubber gasket.
8. Secure the wall plate assembly to box/wall by tightening screws with 5 inch/pounds of torque.
9. Attach patch cords and field term plug assemblies (sold separately) to the mounted connector.

I. Optical fiber connectors, horizontal and backbone

1. Installed fiber connectors shall have proper cable support, routing, and strain relief.
2. The contractor shall inspect 100% of all installed connectors for polish quality and contamination.
3. Fusion splices for pigtail connections shall be protected in a suitable enclosure.

J. Grounding and bonding systems, basic guidelines

1. Telecommunications grounding and bonding system shall be installed in accordance with NEC requirements and per the guidelines of ANSI J-STD-607-A.
2. The telecommunications main grounding busbar (TMGB) shall be bonded to the building main electrical service ground (grounding electrode conductor or GEC) using approved lugs or exothermic weld methods. Bonding to the GEC or TMGB with sheet metal screws is prohibited.
3. the telecommunications bonding backbone shall be a minimum of #6 AWG copper wire conductor. A telecommunications grounding busbar (TGB) shall be installed in the Telecommunications Room on each floor, and call be bonded to the TBB. All metal racks, cabinets, pathways, and enclosures shall be bonded to the TGB.
4. Telecommunications equipment shall be grounded according to manufacturer's instructions and in accordance with all applicable codes.
5. All metallic pathways including conduit, raceway ladder, or cable trays shall be electrically continuous and shall be bonded to ground on each end.
6. OSP cable entering the building or backbone cables having metal sheaths shall have isolation protections. Isolation protectors shall be bonded to the TMGB.

3.5. LABELING

A. General

1. All labels shall be permanent and machine generated by a labeling machine as follows:
   a. Labels shall be on a a permanent polyester material, clear in color.
   b. Lettering shall be black in color.
   c. Hand written labels will not be permitted.
2. The Contractor shall coordinate the labeling scheme with the Owner prior to producing and installing any labels. The Contractor shall provide samples of finished installations at a pre-installation meeting with the Owner prior to completing the installation.
3. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment, faceplates, patch panels, termination blocks, etc.
4. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, schematic designs, and test reports.

B. Cabling

1. All structured cables (horizontal and backbone) shall be labeled at both ends within 6" of cable termination point. Where voice backbone cables extend behind termination blocks cable labels shall be placed at a location on the cable where the labels are visible from the front of the termination block.
2. Labels shall have and adhesive backing and shall wrap completely around the circumference of the cable jacket. Label and lettering shall be of an appropriate size with regards to the cable diameter.

C. Equipment Racks, Termination Hardware, and Faceplates

1. The Contractor shall coordinate the labeling scheme with the Owner prior to producing and installing any labels. The Contractor shall provide samples of finished installations at a pre-installation meeting with the Owner prior to completing the installation.

3.6. TESTING

A. Category 6 Cable Testing

1. Permanent link testing shall be completed on all horizontal (station) cables. The Contractor shall be responsible for supplying a channel warranty but the Owner requires that the contractor supplies all the manufacturer's patch cords per the contract.
2. CAT6 cabling systems shall be tested as an installed horizontal permanent link configuration. Jacks and faceplates shall be assembled, complete and properly mounted into outlet boxes. Panels shall be terminated complete and fully dressed with proper cable management.
3. All CAT6 cables shall be properly labeled prior to testing. Test results shall be in numerical order by Cable ID.
4. All wiring shall be certified to meet or exceed the specifications as set forth in TIA-568C for CAT6 requirements for permanent link. All tests shall be performed to 250 Mhz.
5. Test results shall include the following information for each pair of each cable installed:
    a. Name of the person performing the test.
    b. Test equipment manufacturer and model number.
    c. Cable ID.
    d. Date of Test
    e. Wire map (pin to pin connectivity and polarity check)
    f. Length (in feet)
    g. Insertion loss
    h. Near end cross talk (Next)
    i. Power sum near end crosstalk (PSNEXT)
    j. Equal level far end crosstalk (ELFEXT)
    k. Power sum equal level far end crosstalk (PSELFEXT)
    l. Return loss
    m. Delay skew
    n. Attenuation to crosstalk ratio (ACR)
6. A "PASS" indication shall be obtained for each link using (at minimum) a level III tester that complies with TIA/EIA-568-B.2 field test requirements.
7. Correct all malfunctions and "FAIL" when detected and re-test to demonstrate compliance.
8. Record test results for each cable and provide to the General Contractor for the Owners review. All cables shall "PASS" as a condition of installation acceptance.

B. Optical Fiber Testing

1. Test procedures shall be as described by the following:
    a. TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard parts 2 and 3.
    b. TIA/EIA-526-14-A-1998 Optical Power Loss Measurements Of Installed Multi-mode Fiber Cable Plant-OFSTP-14A
2. Pre-installation Testing:
    a. Test each conductor of every optical fiber on the reel with a light source and power meter.
    b. Obtain the cable manufacturer's power meter test results for each reel used on the project.
    c. Record the readings and the manufacturers reel number on the attached Optical Fiber Test Form
    d. Provide completed forms, optical fiber reel tag IDs and cable manufacturer's test results to the Owner prior to installing cable.
3. Acceptance Testing:
    a. Each terminated fiber strand in the horizontal or backbone infrastructure shall be tested individually as a permanent link. A fiber permanent link is defined as the length of individual fiber strand with a connector terminated on each end.
    b. Testing for multi-mode shall be at 850 and 1300 nanometers. Total link insertion loss (DB) shall be within the specified link loss budget.
    c. Tier 1 testing for each installed single-mode link shall be performed as an optical power insertion loss measurement as defined by ANSI/TIA/EIA-526-7. Testing for single-mode shall be at 1310 and 1550 nanometers. Total link insertion loss (DB) shall be within the specified link loss budget.
    d. Tier 2 testing, if required, for each installed single-mode or multi-mode link shall be performed as an OTDR measurement as defined in TIA-TSB-140. The Owner requires Tier 2 testing on all fibers installed in this facility for future troubleshooting.
    e. Multi-mode optical fiber attenuation shall be tested on all individual fibers of each cable segment using an LED light source and power meter to determine the actual loss. These tests shall be

performed at the 850 and 1300 nanometer windows in both directions. The test setup and performance shall be in accordance with ANSI/TIA/EIA-526-14-A, Method B.

f. A reference power measurement shall be obtained by connecting on end of test jumper 1 to the light source and the other end to the power meter. After recording the reference power measurement test jumper 1 shall be disconnected from the power meter without disturbing the light source and attached to the cable plant. The power meter shall be moved to the far end of the cable plant and attached to the cable plant with test jumper 2.

g. Readings must not be higher than the "Optimal Attenuation Loss" (OAL). The OAL shall be calculated using the actual installed lengths plus the manufacturer's best published attenuation losses for the connector and/or splice installed on this project (0.30+/-0.30 for connectors and 0.10 for splices). The Contractor shall use the OAL for comparison with the end to end power loss test results prior to acceptance.

h. Test results must be completed and turned over to the General contractor and the Owner prior to the contract punch list date. Specific due dates will be determined by the General Contractor.

3.7. CONTRACT CLOSEOUT REQUIREMENTS

A. Closeout Documentation. The Contractor shall assemble all closeout documentation required below and provide it digitally in a PDF, searchable (when applicable), format on a compact disc, thumb drive or other compatible digital device unless otherwise specified below. This documentation shall be kept separate from other similarly required documents and provided to the City of Madison Information Technology representative for review and approval. The documentation shall be provided and indexed as follows:

1. Index of contents
2. Pre-installation test results, one complete set in approved format indicating all pre-installation tests met or exceeded the specification
3. Post-installation test results, one complete set in approved format showing all post installation terminations met or exceeded the specification
4. As-Builts
   a. The Contractor shall maintain through the construction process a paper set of as-built documentation. Upon completion of the installation and verification by the Owner and Design Engineer that all documentation is complete the contractor shall provide the Design Engineer with the paper plans for inclusion into a digital as-built design set.
   b. Complete floor plan as-builts shall indicate all of the following information:
      i. Include detailed information of cable and pathway layouts, locations of pull points/boxes, and other such products and equipment installed.
      ii. Locate all work station outlets, camera, locations and other such data drops; provide the correct alpha numeric cable assigned to each location.
      iii. Where product/equipment locations are dimensionally located provide the installed dimensions by either circling the design dimension if correct or providing the field correct dimension. Provide all dimensions for installations not originally dimensioned in the design.
      iv. Any deviation in location of an installation shall be noted on the drawings regardless of the reason for change. Items grossly not installed in their intended location shall be "X" out and drawn in the installed location
      v. Indicate all items added or deleted to the contract through change order or other such means. Provide the document number that caused the change.
   c. Provide complete details of final installation of all racks and equipment. Provide the alpha-numeric numbers (range low to high) assigned to each patch panel on a rack.
5. Operation and Maintenance information, all of the following items shall be grouped by like item for a specific product or piece of equipment.
   a. A complete set of all submittals
   b. A complete set of all installation instructions for products and equipment installed. Only one (1) copy of each product or piece of equipment needs to be supplied.
   c. A complete set of all operation instructions for products and equipment installed
   d. A complete set of all maintenance/care instructions for products and equipment installed
6. Warranty/guarantee Information
   a. Provide signed contractors warranty letter for installation and service for the period of one (1) year.

b. Provide manufacturer's warranty/guarantee information for all products and equipment installed. Verify with all plans and specifications the required terms of warranties/guarantees. If none are specified provide the default manufacturer's warranty/guarantee.

B. Owner Training. The Contractor shall provide Owner Training as needed on all Division 27 installations. The contractor shall verify with the City of Madison Information Technology representative as to what items will be trained, how much training will be necessary and coordinate training dates and times.

END OF SECTION

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SECTION 27 21 33
WIRELESS ACCESS POINTS (WAP)

PART 1 – GENERAL

1.1. SCOPE

A. The work under this section is for the installation of OWNER PROVIDED, CONTRACTOR INSTALLED Wireless Access Points (WAP).

B. The WAPs shall be installed by the contractor providing and installing the Communications Cable and Equipment. All contractor qualifications and certifications for that section shall apply to this section.

1.2. RELATED SPECIFICATIONS

A. The Contractor shall be responsible for reviewing all other specifications for requirements associated with the complete installation of WAP's. This includes but is not limited to the following:

1. 01 31 23 Project Management Web Site
2. 01 33 23 Submittals
3. 27 00 05 Communications Cabling

1.3. SUBMITTALS

A. Contractor licenses and qualifications are required as part of the complete Division 27 submittal package as indicated under Specification 27 00 05.

B. No submittals are required for the owner provided WAP.

C. Submittals are required for installation/hanger equipment, connectors, and any other required equipment/material required for a complete WAP installation.

PART 2 - PRODUCTS

2.1. WIRELESS ACCESS POINT (WAP) DEVICES

A. The City of Madison Information Technology Department (CoM-IT) will be providing the WAP devices for this project.

B. The WAP device being used will be as manufactured by the Cisco, Model 3700E and shall be used for all types of ceiling mounted installations (suspended, gyp board, open truss, etc).

PART 3 - EXECUTION

3.1. OWNER RESPONSIBILITIES

A. The CoM-IT shall be responsible for ordering, making payment (including shipping fees), and configuring all WAP devices in a timely manner to comply with the Contractors schedule.

B. The CoM-IT shall configure and test each WAP to CoM-IT specifications prior to providing them to the contractor for installation.

C. The CoM-IT shall number each WAP and provide the contractor with a location map indicating where each WAP will be installed.

C. The CoM-IT shall test all WAP's after installation to verify configuration and signaling is correct prior to accepting the final installation of the WAP system.

3.2. CONTRACTORS RESPONSIBILITIES

A. The Contractor shall be solely responsible for coordinating with CoM-IT the scheduling and receipt of all WAP devices with his/her installation schedule.

B. The Contractor shall inspect all WAP devices upon receipt for damage. CoM-IT shall be notified immediately of any damage.

C. The Contractor shall provide all mounting hardware, blocking, and other items required for a complete installation to the manufacturers installation requirements.

D. The Contractor shall install all WAP devices per plans and specifications including cable connections.

E. The Contractor shall be responsible to pick up WAP devices from City IT and delivery to the jobsite.

3.3. FINAL TESTING

A. Contractor shall provide final testing of all WAP devices after installation is complete.

B. In the event any WAP device is not operating properly the contractor shall trouble shoot the installation and work with the CoM-IT to determine if re-configuration of the device will be required.

C. The CoM-IT shall be responsible for reconfiguring WAP's as needed after installation is complete. The contractor shall be responsible for verifying connections, cabling and connectivity of the installation is correct.

3.4. WARRANTY

A. The CoM-IT will be responsible for registering any warranty information associated with the purchase and ownership of all WAP devices.

B. The Contractor shall warrant the installation of the WAP device for one (1) year per the terms of this contract.

END OF SECTION

SECTION 27 41 23
AUDIO-VIDEO ACCESSORIES

PART 1 – GENERAL

1.1. SUMMARY

A. This specification shall identify equipment components and accessories required for to complete Audio-Video (A/V) installations not previously identified in other Division 27 specifications. It does not include materials such as cables, boxes, connectors, conduit, supports and other ancillary equipment required to complete the installation.

B. This specification shall clearly identify responsibilities of various contractors and the Owner including project coordination, installation, and testing of installed components.

C. For the purposes of this specification the term Contractor shall refer to the person(s) responsible for installing and integrating the A/V components and equipment described herein, and may or may not be the same contractor installing other Division 27 and 28 related equipment. Other contractors having related work shall be referred to by full title (Electrical Contractor).

1.2. RELATED SPECIFICATIONS

A. 01 31 23 Project Management Web Site
B. 01 33 23 Submittals
C. 01 78 23 Operation and Maintenance Data
D. 01 78 36 Warranties
E. 01 78 39 As-Built drawings
F. All Division 27 specifications that may apply to this installation
G. Other division specifications that may apply to this work for coordination

1.3. AREAS OF RESPONSIBILITY

A. The General Contractor shall be responsible for ensuring all of the following:
   1. Coordinate with the Contractor and the Owner or Owners Representative the scheduling, purchasing, and receiving of all Owner provided products and equipment.
   2. Coordinate all Contractor related work with the construction schedule.
   3. Coordinate all required Work with the Contractor and other trades during pre-installation meetings and resolve installation issues as needed.

B. The Contractor shall be responsible for all of the following:
   1. Direct coordination with the Owner or Owners Representatives for all equipment being provided and/or configured by the Owner.
   2. Verification of Owner installation requirements prior to installing equipment and accessories.

C. The Owner or Owners Representatives shall be responsible for all of the following:
   1. Coordinating all purchases and deliveries of the Owner provided equipment to the project site with the GC and Contractor so as not to delay the installation or project schedule.
   2. Coordinate the pre-installation configuration of any A/V equipment so as not to delay the installation or project schedule.

1.4. SUBMITTALS

A. The Contractor shall not be required to provide submittals for equipment being provided by the Owner but shall provide submittals for ancillary equipment as needed under this specification or other Division 27 specifications.

B. The Contractor shall provide submittals of the following:
   1. All applicable certifications and licenses of the Contractor and the Contractor's installation team. Applicable certifications and licenses shall be current from the start of the contract through the end of the warranty period.
   2. One (1) submittal for <u>all</u> ancillary A/V and A/V Contractor provided equipment required for a complete A/V installation as follows:
      a. Product information sheets and shop drawings indicating each type/size/model of A/V accessory required for a complete A/V installation. Information sheets shall include the following information:
         i. Performance data for the item
         ii. Plan identification number(s) where applicable

iii. Quantity required for each model

1.5. WARRANTY

A. The Contractor shall warrant for one year the complete installation of equipment and components associated with this contract and installation. Contractors warranty shall be in the form of a written letter on company letterhead referring to the contract information, dates of installation and acceptance, signed by an authorized representative of the Contractors Company.

1. The Contractors warranty shall include but not be limited to the following:
   a. Transportation to and from the location as often as needed during the warranty period.
   b. All labor and materials necessary to properly and thoroughly trouble shoot the system.
   c. All fees associated with the shipping of any component that needs to be returned or supplied by the manufacturer for repair or replacement.
   d. All labor and materials required to remove, repair, replace, or re-install of any component.

B. The Contractor shall also provide all manufacturers warranties/guarantees associated with installed components of the completed installation.

PART 2 - PRODUCTS

2.1. PRODUCTS FURNISHED BY OWNER

A. The following products shall be furnished by the owner under this specification.

1. Wall monitors as indicated in the plans and specifications (see section 2.3 below).
2. IPTV cable boxes

2.2. PRODUCTS FURNISHED BY CONTRACTOR

A. The Contractor shall furnish all material and equipment required for a complete A/V installation per the plans and specifications except where indicated as furnished by Owner.

B. All products, materials and equipment furnished by the contractor shall be new and meet all applicable codes.

C. The Contractor shall provide the following equipment as noted within this specification:

1. All monitor wall mounts
2. Press Box

2.3. WALL MONITORS

A. New wall monitors furnished by Owner shall be of like kind and quality to the monitors listed in the Technology Equipment Schedule on sheet T-000 of the plan set.

B. Existing wall monitors furnished by the Owner shall be similar in quality to those listed in the Technology Equipment Schedule on sheet T-000 of the plan set.

C. Monitor sizes, quantities, and room locations shall be as listed in the Monitor Schedule on sheet T-000 of the plan set.

1. Sizes shall include 30”, 39”, 42”, 60”, and 80” monitors, as required by Owner.

2.4. WALL MOUNTS (MONITOR)

A. The Contractor shall provide wall mount brackets for all wall monitor installations noted in the construction documents.

B. Wall mount brackets shall be appropriately sized to support the monitor sizes described in the construction documents.

C. Each monitor in ganged monitor applications shall have its own mounting bracket, shared brackets will not be allowed. All mounting brackets in ganged monitor applications shall be similar models by the same manufacturer.

D. Wall mount brackets for monitors shall meet the following requirements regardless of size:

1. Black powder coat finish
2. Minimum vertical tilt +15/-5 degrees
3. Thin profile to minimize wall clearance when installation is complete
4. The following list of locations shall have vertical tilt only.
   a. Three (3), wall tilting display mounts. (MNT)
6. Models as manufactured by:
   a. Peerless-AV
   b. Chief Manufacturing
   c. Omnimount

d. Premier Mounts
e. Video Mount Products
f. No other substitutions will be allowed

2.5. IP CABLE BOX

A. IP Cable Boxes shall be provided by the Owner and installed by the Contractor. This section is being provided as informational only. The Contractor shall be responsible for providing/installing the input to the cable box and the output to the monitor.
1. Amino Communications, Aminet A140, cable box (with no DVR)
a. Input = Ethernet 10/100 BaseT via RJ-45 shielded connector
b. Output = HDMI 1.3A with HDCP
c. Power = 120V
d. Decodes up to 720p and 1080i; displays up to 1080p
e. HD graphics up to 1280x720
2. Amino Communications, Aminet A540, cable box (with DVR)
a. Input = Ethernet 10/100 BaseT via RJ-45 shielded connector
b. Output = HDMI 1.3A with HDCP
c. Power = 120V
d. Decodes up to 720p and 1080i; displays up to 1080p
e. HD graphics up to 1280x720

B. The Owner shall designate which model is required at each location.

2.6. PRESS BOX

A. Provide and install one (1) portable press feed distribution box.
1. PressPower2 as manufactured by U.S.Audio, WhirlwindUSA
a. Substitutions shall not be allowed

PART 3 - EXECUTION

3.1. CONTRACTOR COORDINATION

A. The Contractor shall coordinate with the General Contractor (GC) and all other trade contractors as needed for the installation of the A/V Accessories. Coordination shall include a pre-installation meeting during rough-in to ensure blocking, power outlets, and data outlets are properly located.
B. The Contractor shall review all plans and specifications indicating wall and position requirements for accessory A/V equipment and install all required equipment accordingly.
1. The Contractor shall coordinate all connection and installation requirements with other trade contractors doing Division 27 Work.

3.2. GENERAL INSTALLATION REQUIREMENTS

A. Cables/cords shall be properly plugged in. Excess cable/cord shall be neatly looped and bundled using Velcro cable ties. Zip ties, wire ties, and other rigid, semi-permanent restraints will not be allowed.
1. Excess cables/cords shall not be visible after the installation is complete.
a. Example: Cables/cords behind wall monitors shall be neatly bundled behind the monitor and fastened to the monitor wall mount so as not to be visible from the front of the monitor.
B. Equipment mounts shall be properly sized for the equipment being supported. Fasteners shall be of sufficient strength to support the finished installation including required equipment.
1. Fasteners shall be firmly attached to blocking where provided.
2. Fasteners in solid materials such as concrete, brick, etc shall use appropriate sleeves and anchors for the material, weight being supported, and fastener being used.
3. All drop ceiling mount locations shall have tile bridge supports.
C. Final testing of A/V components shall be performed only after all A/V equipment and components within Division 27 have been completely installed to ensure all components have been properly integrated with each other as needed.

3.2. EQUIPMENT INSTALLATION, TESTING, AND ACCEPTANCE

A. Any required system programming (by CoM-IT or Contractor) shall be completed prior to doing any installation testing and acceptance.

B. It is the sole responsibility of the Contractor to notify CoM-IT no less than two (2) weeks in advance of completing the installation to coordinate all final testing of the completed system.

C. Wall Mounts:
   1. Wall mounts shall be securely fastened to the wall and blocking per the manufacturer's supplied instructions and mounting hardware. Wall mounts shall be located horizontally and vertically on the designated wall as indicated in plans and details for each room receiving monitors.
   2. Monitors shall be securely installed on the wall mount.
   3. The mounting bracket shall be tested with the completed monitor and cable/cords properly installed. The completed installation and successful testing of the mounting bracket installation shall provide the following:
      a. All cords/cables are properly plugged in, excessive cable is bundled but not stretched tight, cords/cables are not pinched or impede the mounting brackets range of motion.
      b. Full range of motion in all directions as per the specifications above.

D. Monitor testing shall be part of the overall Division 27 installation of all A/V equipment and requirements. This shall include but not be limited to the following:
   1. Remote control is fully functional at each monitor location
      a. A single remote is used and properly programmed to control monitors, IPTV cable boxes and other devices as needed.
         i. Controls on/off/volume and other related functions as a TV with an IP Cable Box.
         ii. Controls various input modes as a monitor as described in other Division 27 specifications.
         iii. Works with other video/audio feeds as described in other Division 27 specifications.
   2. Monitor (each location) functions in all modes and inputs as designated in the contract documents.
      a. Test with Polycom system
      b. Test with portable devices (laptop, etc)

E. The IP Cable Box shall be tested at each location installed. Testing shall include verifying all intended functions perform as expected including the DVR options on models with DVR capabilities. Troubleshoot and re-test as necessary. Contact Owners Representative if a bad unit is suspected for immediate replacement.

F. The portable Press Box shall be functionally tested per manufacturer's recommendations at each designated connection location.

G. A completed and accepted installation shall pass all of the above tests for each location where equipment will be installed.

H. The warranty period for the completed and accepted installation shall not begin until the date of the accepted general contract. The Contractor shall coordinate this date with the General Contractor.

END OF SECTION

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SECTION 27 51 19
SOUND MASKING SYSTEM

PART 1 - GENERAL

SCOPE

The work under this section includes the required installation, inspection, adjustment, maintenance and testing of a new sound masking system as specified herein. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Quality Assurance
- References
- Submittals
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PART 2 - PRODUCTS
- Acceptable Manufacturers
- Sound Masking Equipment
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PART 3 - EXECUTION
- Installation
- Field Quality Control
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- Testing
- Training

RELATED WORK

All Division 26 and 27 specifications that may apply to this installation.

QUALITY ASSURANCE

Manufacturer: The manufacturer shall have five (5) years documented experience.

Installer: The installing dealer must be a factory-authorized service and support company specializing in the selected manufacturer's product, with demonstrated prior experience with the selected manufacturer's system installation and programming.

The Contractor shall own and maintain all tools and equipment necessary for successful installation and testing of the system and have personnel adequately trained in the use of such tools and equipment.

Service: The manufacturer of the system must have local service representatives within 60 miles of the project site.

The entire installation shall comply with all applicable electrical and safety codes. All applicable equipment shall be listed by Underwriters' Laboratories, Inc.

REFERENCES

ADAAF - Americans with Disabilities Accessibility Guidelines

ANSI S1.4 - American National Standard Specifications for Sound Level Meters

ANSI S1.6 - American National Standard Specifications for Preferred Frequencies and Band Numbers for Acoustical Measurements

ANSI S1.11 - American National Standard Specifications for Octave-Band a Fractional-Octave-Band Analog and Digital Filters

ASTM E 1041-85 - Standard Guide for Measurement of Masking Sound in Open Offices.

ASTM E 1130-02 - Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.

ASTM E 1374-93 - Standard Guide for Open Office Acoustics and Applicable ASTM Standards.

ASTM E 1573-02 - Standard Test Method for Evaluating Masking Sound in Open Offices Using A15 Weighted and One-Third Octave Band Sound Pressure Levels.

NFPA 70 - National Electrical Code.

UL 813 - Standards for Commercial Audio Systems

SUBMITTALS

Submit product data under the provisions of Section 26 05 00.

Product Data Submittal: Provide manufacturer's technical product specification sheet for each individual component type. Submitted data shall show the following:

Compliance with each requirement of these documents. The submittal shall acknowledge each requirement of this section, item-by-item.

All component options and accessories specific to this project.

Electrical power consumption rating and voltage.

Wiring and connection requirements.

Manufacturer's installation instructions, indicating application conditions and limitations of use as stipulated by product testing agency and instructions for storage, handling, protection, examination, preparation, installation, and initiating usage of product.

System Drawings: Project-specific system CAD-generated drawings shall be provided as follows:

Provide a system block diagram noting system components and interconnection between components. The interconnection of components shall clearly indicate all wiring required in the system. When multiple pieces of equipment are required in the exact same configuration (e.g., multiple identical speaker zones), the diagram may show one device and refer to the others as "typical" of the device shown.

Where applicable, an equipment rack plan shall be provided 1 showing rack elevations and dimensions in plan and elevation view. The plan shall include equipment layout within the rack.

Provide voltage drop calculations for each speaker cable circuit or run, showing the drop for the specific circuit or run wattage and cable size used.

Provide list of test equipment proposed for use in testing the installed system.

Quality Assurance:

Provide materials documenting experience requirements of the manufacturer and installing contractor.

Provide system checkout test procedure to be performed at acceptance, including demonstration of specified performance and all required system features and functions listed herein and as further detailed on the drawings.

Coordination Drawings:

Include all ceiling-mounted devices in composite electronic coordination files. Refer to Section 26 05 00 for coordination drawing requirements.

DELIVERY, STORAGE, AND HANDLING

Deliver products to the site under the provisions of Section 26 05 00.

Store and protect products under the provisions of Section 26 05 00.

SYSTEM DESCRIPTION

This section describes the furnishing, installation, commissioning and programming of a complete, turnkey sound masking system.

Performance Statement: This section and the accompanying design documents are performance based, describing the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed or every equipment connection that must be made. Based on the equipment constraints described and the performance required of the system, as presented in these documents, the vendor and the Contractor are solely responsible for determining all wiring, programming, and miscellaneous equipment required for a complete and operational system.

This Contractor shall furnish and install a sound masking system as hereinafter specified and further detailed on the drawings. System shall be completely wired and ready for use including, but not limited to, outlet boxes, conduit, wire, equipment, speakers, controls, and equipment cabinets.

Basic System Requirements: The system shall be capable of providing the following minimum features in addition to those specified elsewhere in this section and on the drawings:

Multi-zone paging system, capable of expanding the quantity of zones by the addition of modular components. System-wide and zone-wide background music from audio source located at equipment head end.

Field-configurable priority override hierarchy for signal source inputs.

Individual volume control for each zone.

PROJECT RECORD DOCUMENTS

Submit documents under the provisions of Section 26 05 00.

Provide floor plans identifying actual locations of all 1 installed overhead paging system equipment and devices.

Provide final system block diagram showing any deviations from shop drawing submittal. Block diagram shall include cable number documenting the numbers installed on both ends of the cable in the field.

Provide documentation of all test results and a statement that system checkout test, as outlined in shop drawing submittal, is complete and satisfactory.

Warranty: Submit written warranty and complete all Owner registration forms.

Complete all operation and maintenance manuals as described herein.

OPERATION AND MAINTENANCE DATA

Submit data under provisions of Section 26 05 00.

Operation and Maintenance Data shall be submitted in hard copy and electronic .pdf format.

Operation data shall include:

Manufacturer’s full operation instructions for each piece of equipment.

Complete documentation of all settings and programming.

Detailed, step-by-step instructions for system operation, including accessing, initiating, and performing all required system features and functions listed herein.

Maintenance data shall include:

Description of servicing procedures:

Documentation of all manufacturer's recommended preventive and remedial maintenance procedures to be performed by the Owner.

Troubleshooting flowcharts.

Spare parts list.

WARRANTY

Unless otherwise noted, provide warranty for one (1) year after Substantial Completion, as defined by the Contract. Certain system components may require additional manufacturer's warranty as described.

The warranty shall:

Ensure that all approved devices, equipment, cabling, and other components specified in this section meet or exceed the specified requirements.

Ensure against product defects.

Cover the replacement or repair of the defective product(s) and labor for the replacement or repair of such defective product(s).

Include emergency service and repair on site, with response times of 48 hours from time of notification. The system shall be repaired and restored to operation within 72 hours of technician's arrival on site.

Refer to the individual product sections for further warranty requirements of individual system components.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturers indicated are for the main system components as noted on the riser diagrams on the drawings. Refer to the Material List on the drawings for acceptable manufacturers of additional equipment.

Cambridge Sound Management.

Speech Privacy Systems

SOUND MASKING EQUIPMENT

The sound masking equipment shall have the following features and functions:

The loudspeakers shall be direct field, radiating directly into the space.

All loudspeakers shall be directly powered and managed by a controller.

The sound masking system shall have controllers that power one or more individually controllable zones. The system shall provide:

One or more rack or wall-mounted controllers, each with one or more zones and one or more line level audio inputs.

Four uncorrelated noise sources per zone. The signals to adjacent loudspeakers shall be uncorrelated.

Direct field loudspeakers that automatically sequence the four noise channels and that are mounted either in office ceiling tiles or other enclosures.

Category 3/5/6 pre-terminated cable assemblies.

Output adjustment on independent channels equalized on a separate 1/3rd octave band equalizer. Octave bands for the sound generator shall range from 25 to 20,000 Hz.

Head end music/paging interface that shall be field selectable.

System Processor/CPU: All system programming shall be retained in nonvolatile RAM,

Basis of Design: Cambridge Sound Management QtPro 3/6.

CABLING

Cables terminated with RJ45 modular connectors.
Type: CAT3 provided with system: CAT5/5A, CAT6 are compatible.

Unshielded solid twisted pair construction; stranded optional.

Meet EIA/TIA Standard 568b.

Optional AWG #24 stranded conductors with overall plenum-rated jacket (CMP (UL)/C(UL) 4PR 24 AWG Plenum).

PART 3 - EXECUTION

INSTALLATION

Comply with all manufacturer's instructions and recommendations for installation of all equipment, devices, and materials.

Provide a privacy index appropriate for the utilization of the space defined as follows:
Confidential Privacy: Privacy Index from 85% to 100%.

It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

Wiring:

Refer to Section 26 05 33 for raceway requirements and Section 26 05 23 for additional wiring requirements. Wiring not installed in conduit shall be plenum rated.

All cabling shall be run "free-air" in non-continuous cable supports or cable tray above accessible ceilings, and in conduit or in a secured metal raceway in exposed areas. Supports shall be spaced at a maximum 4-foot interval. If cable "sag" at mid-span exceeds 6 inches, another support shall be used.

All sound masking system audio cabling including, but not limited to, speaker, line-level audio, and microphone-level audio cabling, shall be installed in its own cable pathway and shall not share any raceway or cable pathway with telephone or computer network cabling or cabling of any other system.

Cable shall not be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires. Cables shall not be attached to or supported by existing cabling, plumbing or steam piping, ductwork, ceiling supports, electrical or communications conduit, or structural elements.

Manufacturer's minimum bend radius specifications for cables shall be observed in all instances.

All cable shall be installed at right angles and be kept clear of work by other trades. To reduce or eliminate EMI, the following minimum separation distances from </=480V power lines shall be adhered to:

12 inches from power lines of </=5-kVa

18 inches from high voltage lighting (including fluorescent)

39 inches from power lines of 5-kVa or greater

39 inches from transformers and motors

All cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed unless noted otherwise.

All cable shall be free of tension at both ends.

Both ends of all cables shall be clearly labeled with an alphanumeric identifier. On speaker cables, the label shall indicate the speaker cable circuit zone or run and the telecommunications room in which the zone or run initiates. On line-level cables, the label shall indicate the signal and signal source. Record all speaker cable identifiers on record drawings.

No acid core or other corrosive flux solder shall be used in this system.

Equipment:

Equipment shall be mounted in shared racks.

All necessary devices, sub-components, accessories, and incidental materials required to provide a complete, turn-key paging system that provides specified performance, and all required system features and functions listed herein and as further detailed on the drawings, shall be provided and installed as part of a complete system.

Install all head end equipment and devices in a manner that allows ample airflow for cooling.

Install and tighten all connectors in accordance with manufacturer's instructions, using the appropriate tools recommended by the manufacturer for that purpose. Use caution to avoid stripping or damaging connectors, terminals, or equipment by over-tightening termination fasteners.

The conductor color code used in terminating system cabling at system equipment and devices shall remain consistent from device to device for each unique device type throughout the project.

Speaker Installation:

Sound masking speakers shall be supported within ceiling structure, exposed, with support cabling fixed to above structure.

Speaker spacing shall not exceed 12' in any direction unless otherwise noted.

Unforeseen field coordination between trades may require speakers to be located other than shown on the drawings. Contractor shall adjust locations as required as follows:

Speakers must be at least 4' from any return air grille in a suspended ceiling.

Speakers must be at least 2' from an air duct or structural beam.

Speakers must not impede access clearance to other equipment.

Speakers must be at least 4' away from any light fixture that has more than a 2" exposed opening to the plenum (AFTER the fixture is installed).

Grounding Requirements:

Furnish and install a minimum #6 AWG bonding conductor from each sound masking system head end component to the nearest wall-mounted telecommunications grounding busbar. Actual bonding conductor size determined by its length. Refer to Section 27 00 05 for grounding and bonding conductor sizing criteria.

Audio cable shields for line level signals shall be connected to the metal equipment chassis at both ends of the cable. Audio cables connected to transformers shall have the cable shield connected to the transformer shield and transformer case ground.

FIELD QUALITY CONTROL

Where these specifications require a product or assembly without the use of a brand or trade name, provide a product that meets the requirements of the specifications as supplied and warranted by the system vendor. If the product or assembly is not available from the system vendor, provide product or assembly as recommended by the system vendor.

Furnish products listed and classified by Underwriters 1 Laboratories, Inc. as suitable for purpose specified and indicated.

Periodic observations will be performed during construction to verify compliance with the requirements of the project documents. These services do not relieve the Contractor of responsibility for compliance with the project documents.

System Setup and Checkout: The installed system shall be a complete and operating system. The Contractor shall provide all incidental materials required for a complete and operating system. The Contractor shall provide all system startup, testing, balancing, tuning, and satisfactory system performance as part of the requirements of this project. This shall include all calibration and adjustments of equipment controls, troubleshooting and final adjustments that may be required.

SYSTEM SETUP, PROGRAMMING, AND ADJUSTMENT

Complete all necessary programming to provide the indicated functionality.

TESTING

Under no circumstances shall the Contractor turn the system on without having all level controls turned off and providing notification to all building occupants in advance.

The Contractor shall conduct all system testing as part of the requirements of this project. This shall include all calibration and adjustments of equipment controls, troubleshooting, and final adjustments or corrective action that may be required to provide a complete system that provides the specified performance and all required system features and functions listed herein and as further detailed on the drawings.

At a minimum, the installer shall perform the following inspections and tests of the installed overhead paging system:

Verify that all features and functionality are operating properly.

Verify that the system receives signal from all sources and routes those signals as specified.

Verify that priority override hierarchy functions properly.

Verify specified paging sound level at each speaker

Verify that all controls are properly labeled and interconnecting wires and terminals are identified.

Document all test results and submit as part of final system documentation package.

Final Acceptance Test:

Provide a minimum of one week notice of testing date to Owner. Document tests performed, adjustments made, and final testing status.

Testing shall not commence until all interior finishes and furnishings are installed. Testing shall be finished prior to occupants occupying the space.

Testing shall be provided at not less than 20 test positions per 50,000 of finished floor space.

Record all test methods, observations, results, equipment reading and corrective actions.

Test, per zone, to the following:

Band	Open Areas (SPL)	Enclosed Areas (SPL)
200 Hz	+2.5	-2

250 Hz	+3	-2
315 Hz	+2	-2.5
400 Hz	+1	-3
500 Hz	0	-4
630 Hz	-1	-5
800 Hz	-2	-6
1000 Hz	-3	-7
1250 Hz	-4	-8.5
1600 Hz	-5	-10
2000 Hz	-6	-12

Masking level shall be adjusted for each 1 zone to ensure that 1/3 octave band centered on band noted above has the final selected sound power level for that zone.

Deviation from the listed values in 1/3 octave bands from 400 to 2000 Hz shall be measured. Measured values shall not deviate from those listed by > 4 dB for open areas and > 8 dB for enclosed areas. The total of individual band deviations in eight bands shall not exceed > 16 dB for open areas and > 30 dB for enclosed areas.

Temporal Stability Test: Check for uniformity to the defined performance requirement stated herein.

Correct deficiencies as required, as identified by tests, and retest until performance requirements have been met.

Record all final settings, programming, tap settings and other configuration parameters.

Record all final sound level measurements and observations.

TRAINING

All labor and materials required for on-site system training shall be provided. Training shall be conducted at the project site using the project equipment.

Provide two week's advanced notice of training to the User. Provide a training outline agenda describing the subject matter and the recommended audience for each topic.

At a minimum, the following training shall be conducted:

Users:

Provide training on the system functions and operations that a daily user will encounter, including navigation of the user interface to accomplish common operations.

Maintenance Staff:

Provide training on the system functions and operations that a daily user will encounter, including navigation of the user interface to accomplish all common operations.

Provide training on all system components and the basic configuration of the system.

Identify and describe preventive and remedial maintenance procedures to be performed by the Owner.

Review troubleshooting flowcharts 1 and describe troubleshooting procedures for common issues.

Minimum on-site training times shall be:

Users: Two (2) hours.

Maintenance Staff: Two (2) hours.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL SYSTEM (KEYSCAN)

PART 1 - GENERAL

1.1. SUMMARY

A. The City of Madison Information Technology Department has been assisting other City agencies with standardizing facilities through the use of access cards, key fobs, and punch pads. All hardware is installed locally at the facility while software controls access to various doors remotely.

B. These specifications describe the materials, equipment, and installation requirements to install an integrated, computerized access control and alarm monitoring system utilized by the City of Madison Information Technology (CoM-IT) Department.

C. The ACS System Contractor shall be responsible for verifying equipment requirements, locations, and coordination with the General Contractor and all other necessary trades as needed for a complete installation.

1.2. RELATED SPECIFICATIONS

A. 01 31 23 Project Management Web Site
B. 01 33 23 Submittals
C. 08 71 00 Door Hardware
D. 14 21 00 Electric Traction Elevator
E. 27 00 05 Communications Cabling

1.3. RELATED DRAWINGS

A. Refer to all Electrical drawings for locations of distribution panels and equipment as it relates to standard line voltage locations.

B. Refer to all Technical drawings for locations of Access Control System (Keyscan) equipment.

C. Refer to the door hardware schedule and Architectural floor plans for information relating to door access locations and specific hardware requirements.

1.4. REFERENCES

A. The system shall comply with the standards, codes and regulations of the following regulatory bodies:
1. Underwriters Laboratories (UL) Std No. 294 – Access Control System Units

2. Canadian Standards Association (CSA) Std C22.2 No. 205-M1983 – Signal Equipment
3. CE Standards
   a. EN 55022 RF Emissions
   b. EN 55024 RF Immunity
   c. EN 60950-1 Equipment Safety
4. FCC Subpart B – RF Emissions
5. Industry Canada ICES 003 Emissions
6. RoHS

1.5. CONTRACTORS QUALIFICATIONS

A. The Contractor installing the ACS system shall:
1. Be a Certified Keyscan Enterprise Partner
2. Utilize installers who are Keyscan Enterprise Certified Technicians
3. Be based within 25 radial miles of the project location
4. Be able to provide 24/7/365 support during the warranty period of this project
5. Be able to respond and repair or replace most components within 4 hours of notification

1.6. SUBMITTALS

A. The Contractor shall provide a complete submittal package in a timely manner to allow sufficient review time prior to ordering the system components required for a complete installation. The contractor shall be solely responsible for any equipment, purchased/ordered/delivered that is not approved of during the submittal review process.

B. The complete submittal package shall include but not be limited to the following:
1. All certifications of the contractor and contractor's installation team. Certifications shall be current from the start of the contract through the end of the warranty period.
2. Cut sheets indicating, shop drawings, performance data, and other such information that will indicate the component being installed matches the component that was specified.
3. Cut sheets and shop drawing of Contractors recommendations for tags and labels.

1.7. WARRANTY

A. The Contractor shall warrant for one year the complete installation of equipment and components associated with this contract and installation. Contractors warranty shall be in the form of a written letter on company letterhead referring to the contract information, dates of installation and acceptance, signed by an authorized representative of the Contractors Company.
1. The Contractors warranty shall include but not be limited to the following:
   a. Transportation to and from the location as often as needed during the warranty period.
   b. All labor and materials necessary to properly and thoroughly trouble shoot the system.
   c. All fees associated with the shipping of any component that needs to be returned or supplied by the manufacturer for repair or replacement.
   d. All labor and materials required to remove, repair, replace, or re-install any component.

B. The Contractor shall also provide all manufacturers warranties/guarantees associated with installed components of the completed installation.

1.8. QUALITY ASURANCE

A. The Contractor shall be responsible for coordinating his/her Work with other trades and divisions as needed for a complete installation. This shall include pre-installation meetings for locating equipment, conduit, cabling, control devices, and other materials and equipment required by this installation.

B. The General Contractor (GC) shall be responsible for ensuring that all doors requiring controlled access are properly prepared and installed per the contract documents. The GC shall further be responsible for ensuring all project coordination, pre-installation meetings, submittals and other such project management responsibilities are conducted efficiently and according to the project specifications and schedules.

PART 2 - PRODUCTS

2.1. EXISTING SYSTEM PRODUCTS OVERVIEW

A. The City of Madison Information Technology Department (CoM IT) owns and operates a fully licensed copy of the Keyscan Access Control System software.

1. The Keyscan Access Control System (ACS) provides controlled access to secured doors and elevators through the use of electronic door latches, proximity readers, control panels, and a proprietary software program.
2. The Keyscan software allows CoM-IT and the facility the Owner to customize multiple levels of access and system performance through any combination of the following:
   a. Calendar and time based lock/unlock controls
   b. Group access control for common personnel groups
   c. Individual access control for specialized access control
   d. Elevator access control for accessing/not accessing various floors
   e. Temporarily disable access control for a specified time period
   f. Remotely unlock/lock a door
   g. Lockdown a facility from one location
   h. Provide customizable alert notifications

2.2. NEW EQUIPMENT AND COMPONENTS

A. The Contractor guarantees that all equipment and components shall be furnished new, undamaged, free of defects, and conform to the drawings and specifications of this contract. The contractor is solely responsible for replacing any damaged or defective item.

B. New ACS components on interior and exterior access doors shall be able to be integrated with the Owners existing system.

2.3. DISTRIBUTION SUPPLY PANEL (AC-DS-1)

A. AC-DS-1 brings line voltage into the ACS system with the following performance specifications:
   1. Input
      a. 115VAC, 60Hz, 1.45A
   2. Output
      a. Eight (8) PTC protected outputs
      b. 16VAC output
      c. 16VAC @ 10amp (175 VA) supply current (1.25 amp per device, 2.5 amp max.)
      d. Outputs rated @ 2.5 amp
      e. Main fuse rated @ 15 amp/32V
      f. Surge suppression
   3. Miscellaneous electrical information
      a. Operating temperature 0^{o} C to 49^{o}C ambient
      b. 81.89 BTU/hr
      c. System AC input VA requirement 166.75 AV
   4. Miscellaneous required features
      a. AC power LED indicators
      b. Illuminated master power disconnect circuit breaker with manual reset
   5. Agency Approvals
      a. UL 294 listed for Access Control System Units
      b. CUL listed-CSA Standard C22.2 No 205-M1983 Signal Equipment

B. AC-DS-1 shall be:
   1. Altronix, AL168175CB
   2. Pre-approved equal

2.4. POWER SUPPLY PANEL (AC-PS-1)

A. The AC-PS-1 brings line voltage from the AC-DS-1, reduces then distributes the voltage to the Access Security Panels (AC-SEC-1) with the following performance specifications:
   1. Input
      a. 115VAC, 60Hz, 1.9A
      b. Power supply input options
         i. One (1) common power input for ACM8 and lock power (factory installed)
         ii. Two (2) isolated power inputs; one (1) to power the ACM8 and one (1) for lock accessory power, (external power supply is required). Current is determined by the power supply connected, not to exceed a maximum of 10 amp total
      c. Eight (8) Access control System trigger inputs with the following options:
         i. Eight (8) normally open (NO) inputs

ii. Eight (8) open collector inputs
iii. Any combination of the above

2. Output
   a. 12VDC or 24VDC @ 6 amp supply current
   b. Eight (8) independently controlled outputs with the following options:
      i. Eight (8) Fail-Safe and/or Fail-Secure power outputs
      ii. Eight (8) form "C" 5 amp rated relay outputs
      iii. Any combination of the above
   c. Eight (8) auxiliary power outputs (un-switched)
   d. Output fuses rated @ 3.5 amp
   e. Filtered and electronically regulated outputs (built-in power supply).
3. Miscellaneous electrical information
   a. Operating temperature 0^{o} C to 49^{o}C ambient
   b. BTU/hr:
      i. 12VDC = 36.85 BTU/hr
      ii. 24VDC = 73.70 BTU/hr
   c. ACM8 board main fuse is rated at 10 amp
4. Battery Backup
   a. Built-in charger for sealed lead acid or gel type batteries
   b. Power supply board maximum charge current 0.7 amp
   c. Automatic switch over to stand-by battery when AC fails
   d. Zero voltage drop when unit switches over to battery backup (AC failure condition)
   e. Battery fail and battery presence supervision (form "C" contact)
5. Miscellaneous required features
   a. Fire Alarm disconnect (latching or non-latching) is individually selectable for any or all of the eight (8) outputs.
   b. Fire Alarm disconnect input options:
      i. Normally open (NO) or normally closed (NC) dry contact input
      ii. Polarity reversal input for FACP signaling circuit
   c. Alarm output relay indicates that FACP input is triggered (form "C" contact rated @ 1 amp 28VDC)
   d. Short circuit and thermal overload protection
   e. AC fail supervision (form "C" contact)
   f. Red LEDs indicate outputs are triggered (relays energized)
   g. Green LED indicates FACP disconnect is triggered
   h. AC input and DC output LED indicators
   i. Enclosure accommodates up to two (2) 12AH batteries
6. Agency Approvals
   a. UL 294 listed for Access Control System Units
   b. CUL listed-CSA Standard C22.2 No 205-M1983 Signal Equipment

B. AC-PS-1 shall be:
   1. Altronix, AL600ULACM
   2. Pre-approved equal

2.5. SECURITY PANEL (AC-SEC-1)

A. The AC-SEC-1 distributes the reduced voltage and control wiring to/from each door with an access control device.
B. AC-SEC-1 shall be:
   1. Keyscan CA8500 – 8 Reader Access Control Panel
C. The AC-SEC-1 shall be provided, located and mounted by the Contractor.

2.6. ELEVATOR FLOOR ACCESS CONTROL PANEL (EFACP)

A. The EFACP distributes the reduced voltage and control wiring to the elevator equipment for providing access control to specific floors while providing general public access to others.
B. EFACP shall be:
   1. Keyscan EC1500 – 1 Cab Elevator Floor Access Control Panel
C. The EFACP shall be provided, located and mounted by the Contractor in the elevator machine room (B11).
D. The EFACP requires two (2), 16.5 VAC, 37 or 40VA transformers to be supplied and installed by the Contractor.

2.7. DOOR CONTROL DEVICES

A. The Contractor shall be responsible for verifying the Door Control Device (DCD) quantities and locations with the door hardware schedule.

B. DCD shall be:

1. Keyscan K-KPR – Keyscan Proximity Reader/Keypad, this reader accepts swipe monitoring of cards, key bobs, and other such devices as well as accepting personal identification numbers (PINs)
    i. Plan designation = AC-CR1-W
2. The K-KPR shall be used for all locations including the elevator cab.

2.8. DOOR CONTROL CABLES

A. The following cables are required for a complete installation of the ACS, per controlled door, as follows:

1. One (1) 22/6 shielded cable, required; to DCD
2. One (1) 18/2 un-shielded cable, required; lock power
3. One (1) 22/2 un-shielded cable, required; door contact
4. One (1) 22/4 un-shielded cable, required but not used; for future request to exit sensors

B. At the Contractors option he/she may run a manufactured cable bundle containing all four (4) cables listed above. It shall be the sole responsibility of the contractor to appropriately size the conduits for the installation.

PART 3 - EXECUTION

3.1. COOPERATION OF THE ACS CONTRACTOR

A. The Contractor shall be required to coordinate with all trades for a complete and timely installation. This includes attending all pre-installation meetings where equipment locations, conduit locations, and control devices will be installed or may be in conflict with the installation of other trades. The Contractor shall be solely responsible for any additional cost required for removing/replacing/modifying any completed work by other trades because the installation was not properly coordinated.

B. The Contractor shall coordinate with the Owners Representative from City IT for all information necessary to complete the installation and integration with the Owners existing hardware and software.

C. The Contractor shall verify with the appropriate Owners Representative for mounting heights of all hardware and equipment prior to installation. This shall be completed at a pre-installation walk through prior to rough-in.

D. The Contractor shall coordinate with the elevator equipment installer the location and wiring of the EFACP.

E. The Contractor shall coordinate with the Owner's Representative from City IT to verify all requirements for all access controlled doors are properly coordinated and understood prior to roughing in the installation.

3.2. GENERAL EQUIPMENT MOUNTING

A. All ACS equipment shall be mounted to the 3/4" AC fire rated plywood panels provided and installed by the General Contractor. Contractor shall tape out all equipment prior to mounting to insure adequate space is allotted for the complete installation per the riser diagrams including all related conduits and cables.

B. The EFACP shall be mounted to the 3/4" AC fire rated plywood panels provided and installed by the General contractor in the elevator Equipment Room. The General Contractor shall coordinate the location of the plywood panels with the Elevator Equipment Contractor and the ACS Contractor prior to installation.

C. All equipment shall be neatly arranged so as to meet or exceed the manufacturer's recommended working space around each component.

D. Equipment to be installed on plywood mounting panels shall include but not be limited to the following:

1. Distribution Service Panel (AC-DS-1)
2. Power Supply Panel (AC-PS-1)
3. Access Control Panel (AC-SEC-1)
4. Elevator Control Panel (EFACP), including transformers
5. All required conduits, and boxes for line voltage

3.3. GENERAL CONDUITS AND WIRING

A. This section shall apply to both the ACS Contractor and the Electrical Contractor. The following division of responsibilities shall apply:

1. The Electrical Contractor shall be responsible for furnishing, installing, and connecting all conduits, connectors, conductors, and other related materials associated with providing line voltage to the ACS system as follows:
    a. Providing an 110V, 15A, dedicated circuit from the designated distribution panel to AC-DS-1 as described in Section 2.3 above.

b. Providing line voltage from AC-DS-1 to AC-PS-1 as described in Section 2.4 above.
c. Providing and installing the required 110V, 20A dedicated duplex outlet in the elevator Equipment Room (B11). Coordinate the location with the ACS Contractor and the Elevator Contractor.

2. The ACS Contractor shall be responsible for furnishing installing, and connecting all conduits, connectors, conductors and other related materials required to complete the installation of the low voltage wiring and door controller cabling.

B. All conduits shall be properly sized for the number of wires or wire bundles being pulled through the conduit. The Contractor shall verify with the manufacturer the recommended fill rate by conduit size and shall not exceed the recommendations.

C. The contractor shall neatly lay out all conduits in such a fashion so as to minimize bending, crossovers, etc.

D. Bends, pull boxes, and pull points shall be sized and located as per all applicable codes and standards for the number of wires or wire bundles in the bend, pull box, pull point.

E. CAT6 cables from each AC-SEC-1 and the EFACP shall be neatly run in cable management equipment supplied and installed by the cabling contractor or conduits supplied and installed by the ACS Contractor as needed. The switch to be used for all ACS equipment shall be located in Telecom Room #507H. Cables shall be labeled on both ends per the cabling specification.

F. The General Contractor and the ACS Contractor shall ensure the following Emergency Access requirements are properly installed and operational prior to the final Madison Fire Department inspection for occupancy.

1. CoM IT shall provide a minimum of six (6) swipe cards to each installed Knox Box for emergency entrance. The cards shall be appropriately coded for entry at all controlled access doors.
2. The following doors shall be wired to unlock in the event of an emergency.
a. Existing Stair #507S-1.

3.4. ACS CONTROL OF ELEVATOR EQUIPMENT

A. The contractor shall coordinate the installation of all required ACS equipment in the elevator Equipment Room with the Elevator Equipment Contractor and the Electrical Contractor.

B. The Elevator Equipment Contractor shall provide and install a 6 conductor, shielded 18 gauge cable between the elevator equipment and the elevator cab for use with the ACS control equipment.

C. The Contractor shall coordinate with the Elevator Equipment Contractor for locating and installing the DCD device (2.7. above) in the elevator cab and for coordinating all wiring between the two systems to attain the desired control specification (3.4.D. below)

D. Prior to programming the elevator controls, coordinate with the City Project Manager and the appropriate representatives from City IT, for final control parameters.

3.5. EQUIPMENT IDENTIFICATION AND LABLEING

A. The Contractor shall provide and install all equipment identification and labeling to the following specifications.

1. Tags and labels shall be permanent rigid plastic or metal tags with engraved or machine stamped lettering. Hand written self stick or metal hand stamped tags will not be accepted.
2. The Contractor shall work out the labeling scheme for doors with City IT, Owner, and Architect prior to ordering any labels or tags.
3. The Contractor shall provide all labels and tags associated with this specification. This shall include the line voltage feed to each AC-DS-1 from the electrical distribution panel.

B. Panels and Boxes

1. All panels and boxes shall be labeled on the outside cover that readily identifies the panel/box as a "Distribution Supply", "Power Supply", "Access Control Panel", "Elevator Floor Access Control Panel", etc. An associated number shall also be on each tag and the number "1" shall be used even if there is only one of that type panel/box.
2. Access Control Panels shall have a card index inside the front cover of each door indicating the controller number, door number, and door location being served by that panel.

C. Conduits

1. Line voltage from electrical distribution panels shall have conduits labeled on both ends as follows:
a. At the distribution panel the line voltage conduit shall be labeled with the system supplied, and the ACS distribution supply panel number.
b. In the Telecommunications Room the line voltage conduit label shall indicate the distribution panel and circuit number(s) controlling the supply line.
2. Conduits between Access Control Panels and the controlled doors shall be labeled on both ends as follows:

a. In the Telecommunications Room each conduit shall labeled with the door number(s) being supplied.
b. Above the finished ceiling where the conduit is exposed prior to going into the wall space that serves the door the conduit shall be labeled with the Door Control Panel and Controller number associated with the door being served.
c. If the conduit size is reduced as control cabling is supplied to doors along the run each change is conduit size shall be re-labeled as noted in 2.b. above.

3. Conduits between equipment and components in the Telecommunications Room do not need to be identified.

3.6. INSTALLATION TESTING AND ACCEPTANCE

A. The CoM IT and the Owner shall be responsible for completing all software programming associated with the installation of this contract prior to the completion of the installation of the system components. It is the sole responsibility of the Contractor to notify the Owner no less than two (2) weeks in advance of completing the installation that all codes and time setting shall be prepared for final installation and testing.

B. The Contractor, CoM IT, and the Owner shall test each access control point with swipe cards and PINs to insure the door unlocks.

C. CoM IT shall test each door using the existing fully integrated software. This shall include but not be limited to the following:
1. Remotely lock/unlock the doors
2. Verify time clock feature works for locking doors
3. Verify swipe cards and PINs work on all doors
4. Verify emergency entrance cards for knox boxes work on all doors for the areas served.

D. The Contractor, CoM IT, and the Owner shall test the elevator floor access functions as follows:
1. With swipe cards and PINs to ensure controlled access to all floors.
2. With no swipe cards or PINs to ensure that the general public can only access the designated public floors and not controlled access floors.
3. Verify time clock feature works for accessing floors

E. A completed and accepted installation shall pass all of the above tests for all controlled access points.

F. The warranty period for the completed and accepted installation shall not begin until the date of the accepted general contract. The Contractor shall coordinate this date with the General Contractor.

END OF SECTION

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SECTION 283100
FIRE DETECTION AND ALARM

Included are the following topics:

PART 1 - GENERAL

SCOPE

The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the new Fire Alarm System as shown on the drawings and as herein specified.

RELATED WORK

The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the following project sections:

Section 26 05 00 - Common Work Results for Electrical
Section 26 05 02 - Electrical Demolition
Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cable
Section 26 05 26 – Grounding and Bonding for Electrical Systems
Section 26 05 29 – Hangers and Supports for Electrical Systems

Section 26 05 33 – Raceway and Boxes for Electrical Systems
Section 26 05 53 – Identifications for Electrical Systems
Section 26 27 26 – Wiring Devices

DESCRIPTION OF WORK

The project consists of a renovation of the Fifth Floor of the Public Health Madison & Dane County Office Building in Madison, Wisconsin. Extend the existing Simplex #4100U system throughout the remodeled areas of the building as shown on the plans.

This system does not require the ALERT strobes. All references to ALERT equipment and functions in these specifications shall be ignored.

The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70 - Article 760 and the manufacturer's recommendations.

Signaling Line Circuits (SLCs), connecting addressable field points to the associated Fire Alarm Control Panel, shall be configured as NFPA style 4 (Class B), with point supervision.

Floors with more than 25 Addressable Devices shall be split into isolated SLC sub-circuits where each circuit shall not have more 25 devices. Where this is done, the floor shall be "split" along a logical, physical boundary.

Network Connections, Data, Audio, and Signaling Line Circuits, which functionally link together multiple panels or Transponders shall be wired in an NFPA Style 6 (Class A) arrangement.

Initiating Device Circuits (IDCs) shall be limited to short runs from Monitor Modules to the connected device, unless specifically stated otherwise herein, and shall be configured as NFPA Style B (Class B), with individual zone supervision.

Notification Appliance Circuits (NACs) shall be configured as NFPA Style Y (Class "B").

Data Circuits to Annunciators shall be configured as NFPA Style 4 (Class "B"). All annunciators shall be fully supervised.

REGULATORY REQUIREMENTS

The complete installation shall conform to the applicable sections of the latest edition of the following Codes and Standards:

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

- NFPA-70 National Electrical Code (NEC) generally, and Article 760 in particular
- NFPA-72 National Fire Alarm Code
- NFPA 101 Life Safety Code
- IBC International Building Code
- IFC International Fire Code
- IMC International Mechanical Code

Madison Fire Department.

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

UNDERWRITERS' LABORATORIES, INC. (UL)

- UL-864 Control Units for Fire Protective Signaling Systems
- UL-268 Smoke Detector for Fire Protective Signaling Systems
- UL-217 Smoke Detectors for Single and Multiple Stations
- UL-521 Heat Detectors for Fire Protective Signaling Systems
- UL-464 Audible Signaling Appliances
- UL-1971 Visual Signaling Appliances
- UL-38 Manually Actuated Signaling Boxes

UL-1481 Power Supplies for Fire Protective Signaling Systems

MANUFACTURER PROVIDED SERVICES

A manufacturer-trained service technician shall provide the following installation supervision. This Technician shall be certified by the equipment manufacturer, and shall have had a minimum of two (2) years of service experience in the fire alarm industry.

The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to the project engineer. The manufacturer's service technician shall be responsible for the following items:

Pre-installation visit to the job site to review equipment submittals and verify method by which the system should be wired.

Periodic job site visits to verify installation and wiring of system, and to perform any partial system programming – required to permit portions of the existing system to be removed.

Upon completion of wiring, final connections shall be made under the supervision of this technician, and final checkout and certification of the system.

At the time of final checkout, technician shall give operational instructions to the Owner and/or his representative on the system.

All job site visits shall be dated and documented in writing and signed by the Electrical Contractor. Any discrepancy shall be noted on this document and a copy kept in the system job folder that shall be available to the Project Engineer any time during the project.

QUALITY ASSURANCE

Unless specifically stated otherwise, each and all items of the fire alarm system shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label.

Notification Appliances may be products of a single, different manufacturer – provided that the Primary Equipment Provider or Manufacturer provides written documentation of compatibility, and agrees to assume any and all responsibility for compatibility with the Control Equipment.

In addition to previously listed UL standards, all control equipment shall be listed under the following UL Standards:

UOJZ	UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.
UL 864	Transient protection
UL 497B	Isolated Loop Circuit Protectors. Where fire alarm circuits leave the building, additional Transient protection must be provided for each circuit.
UL 1481	Power Limited Applications.

QUALIFICATIONS

All equipment shall be supplied by a firm, which specializes in fire alarm and smoke detection systems with a minimum of five (5) years-documented experience. The company shall be an authorized distributor of the proposed equipment

All work shall be performed by a licensed contractor, who is regularly engaged in the installation and servicing of fire alarm systems. Proof of five (5) years documented experience and of factory authorization to furnish and install the equipment proposed shall be furnished prior to contract award, if required by Division of Facilities Development.

Contractor shall be located within three (3) hours of travel time or less from the site of this project.

SUBMITTALS

Under the provisions of Section 26 05 00 and Division 1, submit the following for approval prior to ordering any equipment in accordance with requirements of Division 1, General Conditions. Submit a total of ten (10) sets.

Copies of CAD Files (AutoCAD, latest version) for the Fire Alarm floor plans will be made available to the successful bidder for preparation of the required shop drawings and as-builts

REQUIRED SUBMITTAL MATERIALS

The following items, and any additional items required per Section 26 05 00, shall be included within the submittal package:

Although they may be submitted under separate cover, Submittal Brochures / Booklets / Binders and Shop Drawings shall be submitted together, and shall be treated as a complete set.

COVER SHEET:

The submittals shall contain a cover sheet, which shall include the following information:

Submittal Date
Specification Section(s)
Electrical Contractor (Contact Name, name, address, and telephone number)
Project Name, Project City, Project State, and Project Address.

TABS AND TABLE OF CONTENTS:

The Table of Contents shall appear immediately behind the Cover Sheet, and shall contain a complete listing of all of the tabs contained within the binder / booklet.

Tabbed index sheets shall be inserted into each of the binders, such that each binder is clearly sub-divided into sections. Tabbed sections shall be provided, at minimum, for the following:

One section for each building – All submittal data, which applies to any particular building, shall be located within the tabbed section for the corresponding building. All submittal data within each "building" section shall appear in the same order.

One section for manufacturer's data sheets – divided into sub-sections for the following:

Panel Equipment (Panels, Panel Components / Modules, Printers, Annunciators, etc.)
Addressable Field Devices (Initiating and Control / Monitoring / Isolation)
Non-Addressable Field Devices (Initiating Devices, relays, etc.)
Notification Appliances
Fire-Fighter Communications Equipment if applicable

EQUIPMENT LIST:

A complete equipment list of all components, including the following: Quantity, Manufacturer, Part Number, and Description. If the supplier uses different part numbers from those of the actual manufacturer, the actual manufacturer and part numbers as they appear – marked on the shipping box / packages, shall also be identified on this list.

Each Equipment List shall include a complete listing of the modules, components, and software included for each modular FIRE Alarm Control Panel, Network Panel, Transponder, Outboard Gear Panel or Annunciator. Such items shall be listed in a manner that clearly indicates that such items are parts of / components of a larger unit. Simply stating a single part number and description for such panels shall be unacceptable.

A separate list shall be included for each section, with items grouped by system.

For projects involving multiple systems, separate equipment lists shall be provided - one for each system.

Spare Parts shall also be listed separately, and shall be identified clearly as "Spare Equipment".

PRODUCT DATA:

Manufacturer's product data sheets, and equipment description of all system components. These data sheets shall be highlighted or suitably marked, so that included items and options are indicated. On data sheets that include multiple products, products that are not used shall be crossed out.

Product Data Sheets shall be organized, in order, corresponding to the first occurrence of the corresponding item on the equipment list.

SEQUENCE OF OPERATION:
Complete sequence of operations of all functions of the system. This sequence of operation shall be custom-created for this particular job.

In order to satisfy this submittal requirement, it shall be acceptable to include copies of the "Operation" portions of the specifications, including any applicable schedules / other supplementary information. Copied specification pages shall be marked and highlighted, where the programmed operation will differ from the specified operation. Copied specification pages shall be marked "no changes", where no significant deviation will occur. Other acceptable alternatives shall include written narratives, organized in a logical manner, and Matrix Charts.

Where Matrix Charts are provided, such charts shall be organized and labeled clearly, and shall incorporate suitable levels of detail (refer to NFPA-72 (2007) **A.10.6.2.3(9)** for an example of an acceptable matrix chart). The Leftmost column of the Matrix Chart shall include groupings of initiating devices and other function switches. The Topmost Row shall include groupings of notification appliances and output devices.

BATTERY CALCULATIONS:
These calculations shall clearly illustrate both the Standby and Alarm loads, due to the various field devices and panel components / modules. It is generally recommended to submit such calculations in a "spreadsheet" format. These calculations shall include any reserve / additional capacity, as required elsewhere within these specifications. Final results shall indicate both the minimum battery capacity required and the capacity actually provided.

ADDRESSABLE DEVICE / DESCRIPTOR LIST - Prior to programming the system, submit a chart or printout, listing every system address provided for purposes of alarm initiation, status monitoring, supervised signaling, and auxiliary controls. This printout shall include the corresponding device type and field programmable "custom labels", as they will be displayed on the New System – at the FACP and Local Annunciator. The addresses listed within this document shall directly correspond to the addresses marked on the submitted floor plan drawings. This list will be modified as needed by the Owner and returned to the contractor for final programming in to the system.

NAC WIRE DROP CALCULATIONS:
Calculations shall be provided for all Notification Appliance Circuits (NAC) in the building. It is recommended that this calculation should follow a "spreadsheet" format, and should clearly indicate the following:

The name of the circuit
Point of origin of the circuit
Complete list of all devices served by the circuit, including location and type of each device
Alarm Current Draw for each device, at the applied voltage
Applied Voltage (Based on anticipated battery voltage after specified stand-by & alarm operation)
Acceptable Operating Voltage for each type of device on circuit
Calculated Voltage at each device on circuit

These calculations should mathematically prove that all Notification Appliances on the circuit will receive acceptable power for proper operation, under "worst-case-scenario" conditions.

SHOP DRAWINGS:
All submitted drawings shall be created using AutoCAD, and shall be coordinated so that terminal numbering, circuit designation and equipment or device designations are the same on all drawings. All drawings must be submitted and approved by the engineer before ordering or fabrication starts, but such approval will not waive any specification requirements unless specifically stated. City of Madison shall provide copies of the floor plan drawings, in AutoCAD, to the successful bidder.

Each and every sheet of the Shop Drawings shall be clearly and prominently identified as "SHOP DRAWINGS – PREPARED BY: (insert name of contractor firm preparing the shop drawings)". The name and company logo for the Electrical Contractor should be added to the title block in each sheet, and a revision date shall be inserted on each sheet.

The submitted Shop Drawings shall include the following types of drawings:

PROJECT-SPECIFIC DRAWINGS:
Project-Specific Drawings. These drawings shall include the following:

SYSTEM RISER DRAWING:
A separate riser drawing shall be furnished for each system. Each System Riser shall illustrate all fire alarm circuits, which serve the facility, and shall incorporate the following information, in a clear, concise format:

Point of origin of each circuit (usually a Panel, or a Module within a panel)
Circuit type and labeling
Area served by each circuit
Wire / cable type and size
Locations of Panelboards where primary system power is obtained
The following information for each Field Device:
Device Type
Circuit(s) to which device is connected
Locations of any End-Of-Line Resistor (EOLR)
(and the circuit terminated by any such EOLR)

BLOCK DIAGRAMS:
Showing layout and operation of the entire system.

FLOOR PLANS:
These drawings shall consist of edited versions of the Contract Documents, which shall include the following information:

Fire Department Response Location(s)
Annunciator Location(s)
Panel Location(s)
Device Addresses - The addresses shown on these drawings shall directly correspond to the chart or printout, as specified previously, which spells out specific information about each device, including the field programmable “custom label”.

TYPICAL DEVICE / MODULE WIRING DETAILS:
Component and module wiring diagrams – intended to illustrate terminations and wiring connections to each typical Field Device (Detectors, Notification Appliances, etc.), and each typical panel component / module utilized within the system. This set of drawings shall only include diagrams for modules and components, which are actually used in the provided system(s).

These drawings shall incorporate clear labeling / nomenclature, which shall clearly indicate the corresponding field device or module, to which it corresponds.

OMISSION OF ANY OF THE ABOVE MATERIALS FROM THE SUBMITTALS SHALL RESULT IN AN IMMEDIATE REJECTION OF THE SUBMITTALS FOR THIS PROJECT. If the Contractor has any questions concerning the preparation of these materials, please contact the Engineer.

MADISON FIRE DEPARTMENT PLAN REVIEW
This project requires a submittal to the MADISON FIRE DEPARTMENT for review and approval. The following details the requirements of the contractor and the A/E with regards to the fire alarm submittal. Coordinate all requirements with the Madison Fire Department.

PLAN REVIEW FEES
As required by the Madison Fire Department.
WHAT TO SUBMIT
As required by the Madison Fire Department.

CITY OF MADISON – FIRE DEPARTMENT INSPECTION / FIRE ALARM WORK PERMIT

PER A LOCAL ORDINANCE (City of Madison General Ordinance 34 – Fire Prevention Code) EFFECTIVE AS OF JULY 2, 2002 - THE FIRE ALARM AND FIRE PROTECTION SYSTEMS, AS INSTALLED WITHIN THIS FACILITY ARE SUBJECT TO PERMIT REQUIREMENTS AND INSPECTIONS OF THE INSTALLATION BY THE CITY OF MADISON – FIRE DEPARTMENT / FIRE PREVENTION BUREAU.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SCHEDULING, COORDINATING, AND ATTENDING THIS INSPECTION, AND FOR PAYMENT OF ALL ASSOCIATED INSPECTION / PERMIT FEES.

This process normally involves both a plan review and inspections; however, for State-Owned Buildings, the City of Madison only performs the inspections, with the Plan Review being performed by DSPS as specified previously under "Submittals".

Copies of the applicable Code can be obtained on-line, via the following link:

http://www.cityofmadison.com/sites/default/files/city-of-madison/fire/documents/MGOchapter34.pdf

Because of this Permit / Inspection process, the following procedure shall be followed by the Electrical Contractor, (and by their sub-contractors, where particular arrangements have been made between the EC and their sub-contractor(s)):

First, the Electrical Contractor shall obtain State-Approval of the Installation Drawings, per the process previously described under "Submittals – Plan Review Process", as found within this specification.

Once the State-Approved Drawings are received by the contractor, and PRIOR TO STARTING ANY CONSTRUCTION, the Electrical Contractor shall completely fill-out submit the proper "City of Madison Fire Department – Fire Protection System Work Permit Application" form. If required, suitable fee payment shall accompany the form. Copies of this form may be obtained via the following link:

http://www.cityofmadison.com/sites/default/files/city-of-madison/fire/documents/workpermitapp.pdf

Once the form has been received, processed, and accepted by the Madison Fire Department (MFD), MFD will issue the proper permit, and construction may begin.

The inspection program involves at least two inspections, as follows:

A Rough-In Inspection shall be scheduled and performed, prior to installation of any new devices. In certain buildings (high-rises), multiple rough-in inspections may be required, as subsequent areas are completed. It is highly recommended that these inspections should be carefully scheduled and adhered to, since potentially costly mistakes can be prevented before the associated devices are completely installed.

Final Inspection of the System – prior to this inspection, the Electrical Contractor shall have conducted all necessary pre-testing.

Questions regarding this inspection program may be directed to:

City of Madison Fire Department
314 W Dayton St
Madison, WI 53703
Phone: (608) 266-4420
Fax: (608) 267-1153
fire@cityofmadison.com

PROJECT RECORD DRAWINGS

Installing Electrical Contractor shall submit to the Architect/Engineer for approval the as-built drawings for the entire work done under this project prior to final payment.

Work shall be done on AutoCAD using the contract drawings provided to the Contractor by City of Madison in the form of AutoCAD files. A hard copy of same shall also be submitted.

These drawings shall show:

Locations and addresses of Initiation Devices, Notification Appliances, isolation devices, status-monitoring devices, supervised signaling devices, and auxiliary control devices. All these devices shall be shown as connected to system wiring.
Circuit and Address information for each field device listed above.
Conduit layout.
Number/size/type of conductors in each conduit run
Riser diagrams
Location of end-of-line devices

Riser diagrams shall be specific for this project, and shall include location of emergency 120VAC panel, panel designation and circuit number used to feed each fire alarm panel. Also, indicate if panel is backed up by an emergency generator.

Riser diagrams shall include locations (room or area number) of notification, initiating, end-of-line devices and addresses for all addressable field devices.

Also see requirements in Division 1, General Conditions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. A material guide, which shall contain the replacement part numbers and description of all components used. If this information is included in an instruction section for any of the equipment, it will not be necessary to duplicate the list. In either case, the parts list shall be associated with its respective chassis, modules or kit wherein it is found. A total listing of parts without such grouping will not be acceptable.
2. Catalog data or literature
3. Manufacturer's operating instructions
4. Manufacturer's maintenance instructions
5. Installation instructions
6. Name, address and telephone number of source for parts (i.e. keys, guards, etc) not supplied by the Fire Alarm Manufacturer
7. Copies of all approved shop drawings
8. An updated copy of the submitted sequence of operation, revised to reflect any implemented changes

PRODUCT DELIVERY, STORAGE AND HANDLING

Receive equipment at job site; verify applicable components and quantity delivered.

Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.

Do not install damaged equipment.

Store equipment in a clean, dry space and protect from dirt, fumes, water, and construction debris and physical damage. Make arrangements with the Owner at the pre-construction meeting for storage of equipment on the premises

SPARE PARTS

Contractor shall provide the following spare parts in quantities shown:

Quantity :	Type of Device
(1)	Photoelectric smoke detectors
(1)	Smoke and heat detector bases – “standard” 2-Wire Type
(1)	Wall mounted multi-candela Horn/strobe Units
(1)	Ceiling mounted multi-candela Horn/strobe Units

SUPERVISION

The system shall report a TROUBLE condition when any supervised circuit becomes disarranged, disconnected, or is manually disabled or overridden. Each supervised circuit shall be independently protected for short-circuit conditions, and shall be arranged so that faults on any one circuit do not prevent the proper operation of any other circuit in the system.

The following devices/circuits shall be supervised, as a minimum:

- ALL communications links.
- ALL Signaling Line Circuits
- ALL Initiating Device Circuits.
- All sprinkler flow and tamper switches.
- ALL Notification Appliance Circuits.
- Auxiliary manual control circuits.
- Manual control switches for off normal position
- Remote Control Relays / Control Modules.
- Primary, AC Incoming power to the system.
- The system's batteries.
- System Expansion Modules
- Auxiliary module LED's.

The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

Each independently supervised circuit shall include a discrete LCD readout, to indicate disarrangement conditions per circuit.

POWER REQUIREMENTS

Primary 120 VAC power, to all Fire Alarm equipment shall consist of dedicated branch circuits. These circuits shall be of a 3-conductor type, including a suitably sized green ground wire – SHARED NEUTRALS AND CONDUIT GROUNDS SHALL BE UNACCEPTABLE.

All fire alarm power supplies, as well as any other supplemental power supplies, shall be installed in compliance with NFPA-70 – National Electrical Code (Latest Edition).

All external circuits requiring system-operating power shall be 24VDC and shall be individually supervised and fused at the control panel.

PART 2 - PRODUCTS

EXISTING FIRE ALARM CONROL PANEL

The existing panel is a Simplex #4100U panel.

OPERATION: EXISTING FIRE ALARM SYSTEM

Maintain the existing system operation.

REMOTE ANNUNCIATOR - FAAP

Existing FAAP to remain.

NAC BOOSTER PANELS (Remote Power Supplies):

Where they are used, “NAC Power Booster Panels” shall be individually supervised. Interconnecting NAC Booster Panels in a manner, which prevents identification of individual panel TROUBLE conditions, shall not be approved. NAC Booster Panels shall be wired to dedicated Emergency Power Branch Circuits where available.

If NAC Booster Panels are needed at locations other than those identified on the construction drawings, the Electrical Contractor shall obtain approval for their proposed installation locations. At such locations, the EC shall provide any required circuit breakers, associated power wiring, and local smoke detection at the approved location. Power shall be obtained from the nearest available emergency panel. The cost of such equipment and installation shall be included within the base Electrical Bid.

MULTIPLEX/INTELLIGENT PERIPHERAL DEVICES

All devices shall be supervised for trouble conditions. The system control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Failure of a device shall not hinder the operation of other system devices.

DEVICE IDENTIFICATION

Each intelligent device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address shall not be acceptable.

Device addressing schemes which use permanently-imbedded, electronically-identifiable "serial number" which is similar to the address imbedded within Personal Computer Network Interface Cards shall be acceptable.

Fire Alarm Systems utilizing hand-held or briefcase-style programming tools, which are used to electronically assign addresses and/or programming parameters to devices shall be acceptable. However one such programmer tool shall be provided to the Owner at no additional cost.

The address along with the loop number and end-of-line device if present shall be indicated, and be visible from the ground, on the device in the field using machine generated marking. Contractor shall provide a sample of such labeling scheme before using it.

End-of Line devices shall also be identified by means of permanent, machine generated label, affixed to the device.

Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t tapping and the addition of an intelligent device between existing devices requires re-programming all existing devices beyond added device.

The system must verify that proper type device is in place and matches the desired software configuration.

INTELLIGENT DETECTORS - GENERAL

Smoke and heat detectors must be approved by the Madison Fire Department.

Each detector shall incorporate the following features:

- LED(s), which shall flash to indicate communication with the Fire Alarm System, and which also illuminate in a steady manner when the detector is in an alarm status
- A means to allow field function testing of the detector
- A low-profile design / shape
- An insect screen
- Voltage and RF transient suppression techniques, in order to minimize false alarms

Smoke detectors shall communicate the actual smoke chamber values to the system control panel.

Smoke detectors shall be listed for sensitivity testing from the control panel. Sensitivity test results shall be logged and downloaded to a printer.

The detectors shall be plug-in units, which mount to a common base, and shall be UL 268 approved.

Each detector shall be compatible with the fire alarm panel and shall obtain its operating power from the SLC, to which it is connected. (Where relay or sounder-equipped bases are used, it shall be acceptable to require a separate 24 VDC or NAC connection.) Each detector shall be reset by actuating the control panel reset switch.

If field conditions so require the smoke detection devices shall not be installed until the construction is completed.

INTELLIGENT DETECTOR BASES

Bases shall be suitable for either smoke or heat detector mounting.

Either the base or the head shall contain electronic circuits that communicate the detector's status (normal, alarm, sensitivity status, trouble, etc.) to the control panel over two wires. The same two wires shall also provide power to

the base and detector. Contacts between the base and head shall be of the bifurcated type using spring-type, self-wiping contacts.

The base shall be lockable. The locking feature must be field-removable when not required.

Upon removal of the detector's head, a trouble signal shall be transmitted to the control panel.

The detector base shall be sealed against rear airflow entry.

Each detector's base or head shall contain LED(s), which shall flash when the detector is being scanned by the control panel. The LED(s) shall turn on steady when the detector is in an alarm condition.

INTELLIGENT PHOTOELECTRIC SMOKE DETECTORS
The detectors shall contain no radioactive material.

Detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle using a pulsed infrared LED light.

FAULT ISOLATOR MODULE (FIM)
The system shall employ Fault Isolator Modules (FIM) on the Signaling Line Circuits. These FIM units shall be utilized in order to isolate portions of SLCs, in the event of short circuit conditions. The SLC segment protected by each FIM shall be separated from the SLC in a manner such that a single short-circuit condition may not affect more than 25 Addressable Field Devices / Detectors, which are served by the isolated SLC segment.

The FIM shall be located as close as practical to the point where the isolated SLC sub-circuit branches, and shall also be located at an accessible location.

DOOR HOLDERS
Magnetic door holders shall have an approximate holding force of 25 Ibs (minimum) (recommended 35 lbs.)

The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing.

Unit shall be capable of being either surface, flush, or semi-flush mounted as required.

Power for 24 v dc door holders shall be independent and separate from the main power supply of the fire alarm panel.

AUDIO VISUAL NOTIFICATION APPLIANCES
HORN/STROBES
Horns shall have vandal resistant metal or Lexan white housing or grills. Horns shall be polarized, and shall be compatible with the 24 VDC NACs provided by the control panel and/or NAC Booster Panels/Supervised Control Modules. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit.

Horns shall be UL listed to provide a minimum sound pressure level of 93 dB at 10 feet, per UL Standard 464.

PART 3 - EXECUTION

GENERAL
The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70 - Article 760 and the manufacturer's recommendations.

Smoke detectors shall not be mounted until the construction is completed, unless they are covered with plastic bags or fitted covers immediately after installation to maintain cleanliness.

RACEWAYS
NOTE: ALL FIRE ALARM SYSTEM WIRING SHALL BE INSTALLED WITHIN METALLIC CONDUIT UNLESS SPECIFIED OTHERWISE.

All wiring shall be in a conduit system separate from other building wiring. See Section 26 05 33 – Raceway and Boxes for Electrical Systems for specifications.

All wiring shall be in minimum ½" steel raceway, unless free-air wiring is approved by City of Madison.

40% fill factor shall be applied to all conduit sizes.

The contractor shall size conduit and boxes by circular mil size of each cable in each conduit or box. The circular mil sizing can be found on the manufacture's spec sheet, then use the NEC codebook to make calculation to follow NEC Chapter 9 Tables and Annex C for box and conduit fill.

The contractor is encouraged to use red conduit for fire alarm systems.

There shall be no sharp edges with installed materials.

Use only identified conduit entries or request approval for other penetrations in cabinets; (certain areas require clear space for interior components / batteries). Cabinet shall be grounded to either a cold water pipe or grounding rod.

Existing conduit and surface metal raceway that is ½" in size or larger may be reused if found to have adequate space provided that it only serves the fire Alarm system and doesn't contain any AC wiring. All existing conduit that is reused MUST be brought up to the current State of Wisconsin Electrical Code and Approved for usage by the Engineer prior to work being done.

CONDUCTORS

All wire and cable associated with this system shall be as required by the equipment manufacturer. The following information is intended for estimating purposes only. However, the minimum wire gauges and colors specified shall be strictly adhered to. All cable shall be installed as per NEC Article 760.

Type FPL wiring is required if the system is run in conduit or 'free-air.

All initiation and notification circuit cabling shall be listed Type FPL (300V) in accordance with NEC article 760."

All cables and wires #14 AWG and larger shall be stranded.

Fire alarm wiring shall be held in place at the device box, by means of a two-screw connector, (do not use squeeze or crimp type connectors).

All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.

All conductors shall be color-coded. Coding shall be consistent throughout the facility. Green wire shall be used only for equipment ground.

Leave 8-inch wire tails at each device box.

Cable for Intelligent detector Loops shall be 18 to 12 AWG twisted pair with a shield jacket or per manufacturers recommendations installed in ½" conduit. Shield continuity must be maintained and connected to earth ground only at the control panel.

SLC wiring must not be in the same conduit with AC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for all class B SLCs.

All splices or connections shall be made within approved junction boxes and with approved fittings. Boxes shall be red and labeled "FIRE ALARM SYSTEM" or "FA" by decal or other approved markings.

Horn and strobe circuits shall have separate conductors, and shall operate independently of each other.

Strobe wiring shall be #14 AWG minimum.

Tray cable is not acceptable for use as fire alarm system wiring installed in conduit.

DEVICE MOUNTING

Unless otherwise noted on the drawings, plans, specifications or by the Architect or Engineer; the recommended mounting heights, and requirements are as follows:

VISUAL AND AUDIO / VISUAL NOTIFICATION APPLIANCES

In Public-Mode Areas, as defined within NFPA-72, install flush, semi-flush or surface between 80 inches and 96 inches or 6 inches below finished ceiling or at 80 inches from the bottom of the device to the highest level of the finished floor. No devices protruding 4 inches or more shall be installed lower than 80 inches. If these requirements are not achievable, consult with the Engineer before installation.

Audio/visual devices may be installed on the ceilings only where indicated, or where approved in writing by the Engineer. (In such cases, these devices shall be installed in accordance with current NFPA 72 standards). Audio/visual devices installed on ceilings shall have white grills

Except as noted in the previous paragraph, all audio/visual devices shall be wall-mounted at the same height throughout the facility.

Strobes spacing shall be in accordance with NFPA 72.

For surface mounting, use manufacture-supplied back boxes and trim plates, which shall be painted Red or off White, and shall contain no visible conduit knock-outs. Mark each device with its circuit number.

HEAT AND SMOKE DETECTORS

The location of detectors shown on the plans is schematic only. The detectors must be located according to code requirements.

Surface mounted detectors shall be installed using back boxes equal to the base's size. Standard octagon and square boxes are not acceptable.

Detectors should be located on the highest part of a smooth ceiling so that the edge of the detector is no closer than 4 inches from a sidewall. Ceilings with beams, joists or soffits that exceed 8 inches in depth require special planning and closer spacing.

If it is necessary to mount a detector upon a sidewall, the top of the detector (the sensing chamber portion of the device) shall be located no closer than 4 inches from the ceiling and no further away than 12 inches.

Smoke detectors should be installed to favor the air flow towards return openings and not located closer than 3 feet from air supply diffusers which could dilute smoke before it reaches the detector. No detectors shall be installed in direct airflow.

Heat and smoke detectors should be located near the center of the open area which they are protecting, thus providing coverage generally for 15-foot radius for heat and smoke detectors. Questionable locations shall be verified with Architect or Engineer before installation takes place.

Heat and smoke detectors / Sensors – both Intelligent and non-addressable, shall be installed in accordance with their UL Listed Spacing. The quantity of Heat and smoke detectors / Sensors depicted on the drawings is based on the 900 square foot per detector rule. If detectors with significantly different spacing requirements are selected by the fire Alarm equipment provider / Contractor, then additional detectors / sensors, if required, shall be provided at no additional cost to the project.

IDENTIFICATION

Attach the label containing the address and SLC designation to:

Each addressable detector. Label shall be visible and readable from the floor, 3/16" minimum character size (¼" is recommended).

Each manual pull station. Label shall be placed on the top part
Each Addressable Module. Label shall be attached to the faceplate

Label shall consist of black writing on white or clear background.

All fire alarm boxes shall be painted red and labeled "Fire Alarm" or “FA”. When red conduit is used for the fire alarm system installation, there is no need to paint the boxes. Non-factory device boxes shall also be painted red.

All circuits must be labeled with the name of circuit and the area being served by the circuit.

Wire/cable splices in junction boxes shall be labeled indicating where the wire/cable is coming from and where it is going.

All conductors terminated in control panels, annunciator panels and extension panels shall be labeled.

All audio visual devices shall be labeled by each circuit and the order of the device on that circuit such as “Circuit No. 2, strobe No. 05 of 10”.

All labels shall be permanent, and be machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS SHALL BE ALLOWED. Submit a sample for approval before using any labeling schemes.

Label size shall be appropriate for the conductor or cable size(s) and design. All labels to be used shall be self-laminating, white/transparent vinyl and be wrapped around the cable (sheath). Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

Adhesive type labels not permitted except for phase and wire identification.

TESTING

Before proceeding with any testing, all persons, facilities and building occupants whom receive alarms or trouble signals shall be notified by the contractor to prevent unnecessary response or building occupant distress. At the conclusion of testing, those previously notified shall be notified that testing has been concluded.

The manufacturer's authorized representative shall provide on-site supervision of installation of the complete fire alarm system installation, perform a complete functional test of the system, and submit a written report to the Contractor attesting to the proper operation of the completed system prior to final inspection.

Contractor shall pre-test each and every device in the system before the system is considered ready for final inspection.

The completed and pre-tested fire alarm system shall be fully tested in accordance with NFPA-72 by the Contractor in the presence of the Engineer, City of Madison representative, Owner's representative and the local Fire Marshal.

The Engineer or his authorized representative may suspend or discontinue the tests at any time performance is considered unsatisfactory. Resumption of testing will cover untested elements and any replaced elements. The contractor shall furnish all test personnel, test instruments and equipment of the accuracy necessary to perform the test. Arrangements for testing must be made with the City of Madison representative and the Engineer at least two weeks before the proposed testing date.

Upon the completion of a successful test, and prior to the final request for payment the Contractor shall:

Certify the system to the Owner in writing
Complete the NFPA 72 record of completion form
Provide as builts and O&M manuals.
Provide a signed statement that the Owner had received the specified system operation and maintenance training

The final payment will not be processed unless these documents are complete and are on hand.

WARRANTY

The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of two (2) years from the date of substantial completion of the project.

At the end of the project, the Contractor shall post the warranty period along with the company's name and telephone number inside the fire alarm panel.

Any occupied facility shall not be without a UL and an NFPA approved and fully operational fire alarm system for a period longer than two (2) hours. Emergency response shall be provided within two (2) hours of the notification, to the contractor, of the failure of the system to perform operationally per UL and NFPA standards. Non-emergency service calls shall be responded to within twenty-four (24) hours of the notification to the contractor.

Emergency situations may include, but not limited to

- System can't be acknowledged or reset
- System is non-responsive to commands
- System in non-responsive to actuated alarm devices
- Malfunction of notification/initiating circuit(s)
- System going into alarm/trouble without indicating the source
- System is dead (no power), etc.

Repairs and/or replacement arising from emergency situations shall be completed within twenty-four (24) hours of the time of notification. Other than emergency, actual repairs and /or replacement shall be provided within seventy two (72) hours of the time of notification during normal working hours, Monday through Friday, excluding holidays. If the repairs involve parts that are not shelve items and require lead time, the contractor shall inform the Owner within twenty-four (24) hours from the time of notification of the exact time when the repairs will be completed.

If repair and/or replacement cannot be made within the prescribed time, then other means and methods of protection shall be provided to insure the safety of the building's occupants during which time the system is not in compliance with the standards. This may involve up to and include hiring Owner approved qualified personnel to stand a fire watch, all at the contractor's expense.

Warranty service for the equipment shall be provided by the system supplier's factory trained representative. Further, Warranty shall include all parts, labor and necessary travel.

SPECIAL CONSIDERATIONS

Contractor shall refer to Division 1, General Requirements, "SPECIAL SITE CONDITIONS".

The contractor must maintain the existing fire alarm system operational during the construction period. During periods of construction where dust or dirt may contaminate the existing detectors, the contractor shall cover the detectors to avoid nuisance alarms and trouble-calls.

Individual zones and/or devices of the existing fire alarm system can be bypassed by the contractor during construction under the following requirements:

The Superintendent of Buildings and Grounds is notified of which zones and/or devices are inoperative and for how long in writing, hand delivered.

The contractor covers all manual-pull stations that are not active and post temporary fire alarm notification procedures next to each inactive manual-pull station.

Ensure the fire alarm system is fully operational before leaving the job site.

END OF SECTION

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