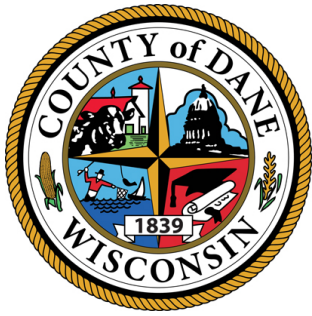


RFB NO. 320028



CONSTRUCTION DOCUMENTS PROJECT MANUAL

DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HIGHWAY AND TRANSPORTATION

PUBLIC WORKS ENGINEERING DIVISION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

REQUEST FOR BIDS NO. 320028
CHILD SUPPORT AGENCY REMODEL - SUITE 365
CITY-COUNTY BUILDING
210 MARTIN LUTHER KING JR. BLVD.
MADISON, WISCONSIN

ISSUED FOR BIDS: APRIL 27, 2021

Due Date / Time: **TUESDAY, JUNE 1, 2021 / 2:00 P.M.**

Location: **PUBLIC WORKS OFFICE**

Performance / Payment Bond: **100% OF CONTRACT AMOUNT**

Bid Deposit: **5% OF BID AMOUNT**

FOR INFORMATION ON THIS REQUEST FOR BIDS, PLEASE CONTACT:

SCOTT CARLSON, PROJECT MANAGER
TELEPHONE NO.: 608/266-4179
FAX NO.: 608/267-1533
E-MAIL: CARLSON.SCOTT@COUNTYOFDANE.COM

SECTION 00 01 07

SEALS PAGE

BID NO. 320028

**PROJECT: CHILD SUPPORT AGENCY REMODEL - SUITE 365
CITY-COUNTY BUILDING**

ARCHITECT

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of Wisconsin.



Dawn O'Kroley - Registration No. 9446

Dated: April 27, 2021

MECHANICAL ENGINEER

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.

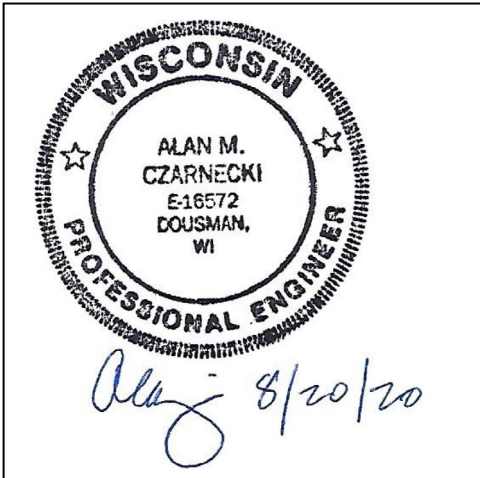


Jessica Culver - Registration No. 45768-6

Dated: April 27, 2021

ELECTRICAL ENGINEER

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Alan Czarnecki - Registration No. 16572-6

Dated: April 27, 2021

END OF SECTION

SECTION 00 01 10

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- 00 01 10 - Table of Contents
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- 00 41 13 - Bid Form
- 00 43 36 - Proposed Subcontractors List
- 00 52 96 - Sample Public Works Construction Contract
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- 00 73 00 - Supplementary Conditions
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- 12 24 13 - Roller Window Shades

DIVISION 21 - FIRE SUPPRESSION

- 21 05 00 - Basic Fire Suppression Materials and Methods
- 21 13 13 - Wet-Pipe Fire Supression Sprinklers

DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

- 23 05 00 - Basic HVAC Requirements
- 23 05 15 - Piping Specialties
- 23 05 23 - General Duty Valves for HVAC
- 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- 23 05 53 - Identification for HVAC Piping and Equipment
- 23 05 93 - Testing, Adjusting and Balancing for HVAC
- 23 07 00 - HVAC Insulation
- 23 09 13 - Instrumentation and Control Devices for HVAC
- 23 09 23 - Direct Digital Control System for HVAC
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DIVISION 26 - ELECTRICAL

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- 26 09 23 - Occupancy Sensor Lighting Control System
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DIVISION 27 - COMMUNICATIONS

- 27 10 00 - Telecommunications Distribution System

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

- 28 31 00 - Fire Alarm System

DRAWINGS

Plot drawings on 24" x 36" (ARCH D) paper for correct scale or size.

General

- G1.0 - Cover Sheet and Index of Drawings

Demolition

- D2.1 - Partial Third Floor Demolition Plan
- D3.1 - Partial Third Floor Demolition Reflected Ceiling Plan

Architectural

- A2.1 - Partial Third Floor Plan
- A3.1 - Partial Third Floor Reflected Ceiling Plan
- A7.0 - Interior Elevations, Partition Types, Details & Door Schedule
- A9.1 - Partial Third Floor Finish Plan

Fire Protection

- F0.1 - Fire Protection Symbols & Abbreviations
- F1.1 - Partial Fire Protection Demolition Floor Plan
- F1.2 - Partial Fire Protection Floor Plan

HVAC

- M0.1 - Mechanical Symbols and Abbreviations
- M0.2 - Mechanical General Notes
- M1.1 - Partial Mechanical Demolition Floor Plan
- M1.2 - Partial Mechanical Floor Plan
- M6.1 - Mechanical Schedule and Details

Electrical

E0.0 - Electrical Symbols, Abbreviations and Sheet Index

E1.0 - Partial Third Floor Electrical Demolition Plan

E1.1 - Partial Third Floor Lighting Plan

E1.2 - Partial Third Floor Power/Systems Plan

E1.3 - Electrical Details

END OF SECTION

SECTION 01 11 16

INVITATION TO BID

LEGAL NOTICE

Dane County Dept. of Public Works, Hwy & Transp., 1919 Alliant Energy Center Way, Madison, WI 53713, will receive sealed Bids until:

2:00 P.M., TUESDAY, JUNE 1, 2021

RFB NO. 320028

CHILD SUPPORT AGENCY REMODEL - SUITE 365

CITY-COUNTY BUILDING

210 MARTIN LUTHER KING JR. BLVD., MADISON, WI

Dane County is inviting Bids for construction services to remodel Child Support Agency offices in the City-County Bldg. Only firms with capabilities, experience & expertise with similar projects should obtain this Request for Bids (RFB) document & submit Bids.

RFB document may be obtained after **2:00 p.m. on April 27, 2021** from bids-pwht.countyofdane.com. Please call Scott Carlson, Project Mgr., at 608/266-4179, or our office at 608/266-4018, for any questions.

All Bidders must be qualified as a Best Value Contractor before Bid Due Date / Time. Complete Application for Contractors at publicworks.countyofdane.com/bvc or obtain one by calling 608/267-0119.

Pre-bid facility tour will be held May 18, 2021 at 1:00 p.m. at the City-County Bldg, starting outside at the W. Wilson St. entrance, then moving to Suite 365. Bidders are strongly encouraged to attend. See RFB for mandatory disease transmission prevention practices.

PUBLISH: APRIL 27 & MAY 4, 2021 - WISCONSIN STATE JOURNAL

APRIL 28 & MAY 5, 2021 - THE DAILY REPORTER

END OF SECTION

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

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1. GENERAL

- A. Before submitting Bid, bidder shall thoroughly examine all Construction Documents. Successful Bidder shall be required to provide all the Work that is shown on Drawings, set forth in Specifications, or reasonably implied as necessary to complete Contract for this project.
- B. Bidder shall visit site to become acquainted with adjacent areas, means of approach to site, conditions of actual site and facilities for delivering, storing, placing, and handling of materials and equipment.
- C. Pre-bid meeting is scheduled on May 18, 2021 at 1:00 p.m. at the Child Support Agency at the City-County Building, 210 Martin Luther King Jr. Blvd., starting outside at the W. Wilson St. entrance, then moving to Suite 365. Attendance by all bidders is optional, however bidders and subcontractors are strongly encouraged to attend.
- D. Safe distancing & face masks are required for all tour attendees. Tours will be limited to 10 people; please limit number of attending staff & subcontractors. If there are more than 10 people, group will be split & there will be two or more tours. Allow sufficient time if you do not make it in to first tour group. Do not visit the site if you are or have recently been ill.
- E. Failure to visit site or failure to examine any and all Construction Documents will in no way relieve successful Bidder from necessity of furnishing any necessary materials or equipment, or performing any work, that may be required to complete the Work in accordance with

Drawings and Specifications. Neglect of above requirements will not be accepted as reason for delay in the Work or additional compensation.

2. DRAWINGS AND SPECIFICATIONS

- A. Drawings and Specifications that form part of this Contract, as stated in Article 1 of General Conditions of Contract are enumerated in Document Index of these Construction Documents.
- B. Complete sets of Drawings and Specifications for all trades will be available to all Bidders, irrespective of category of work to be bid on, in order that all Bidders may be familiar with work of other trades as they affect their bid.

3. INTERPRETATION

- A. No verbal explanation or instructions will be given in regard to meaning of Drawings or Specifications before Bid Due Date. Bidders shall bring inadequacies, omissions or conflicts to Owner or Architect / Engineer's attention at least ten (10) calendar days before Bid Due Date. Prompt clarification will be available to all bidders by Addendum.
- B. Failure to so request clarification or interpretation of Drawings and Specifications will not relieve successful Bidder of responsibility. Signing of Contract will be considered as implicitly denoting that Contractor has thorough understanding of scope of the Work and comprehension of Construction Documents.
- C. Owner or Architect / Engineer will not be responsible for verbal instructions.

4. QUALIFICATIONS OF BIDDER (CONTRACTOR AND SUBCONTRACTOR)

- A. Before award of Contract can be approved, Owner shall be satisfied that Bidder involved meets following requirements:
 - 1. Has completed at least one (1) project of at least fifty percent (50%) of size or value of Division of work being bid and type of work completed is similar to that being bid. If greater magnitude of experience is deemed necessary, other than size or value of work, such requirements will be described in appropriate section of Specifications.
 - 2. Maintains permanent place of business.
 - 3. Can be bonded for terms of proposed Contract.
 - 4. Contractor and subcontractors shall meet all applicable Best Value Contractor requirements.
 - 5. Has record of satisfactorily completing past projects. Criteria which will be considered in determining satisfactory completion of projects by bidder will include:
 - a. Completed contracts in accordance with drawings and specifications.
 - b. Diligently pursued execution of work and completed contracts according to established time schedule unless Owner grants extensions.
 - c. Fulfilled guarantee requirements of construction documents.
 - d. Is not presently on ineligible list maintained by County's Department of Administration for noncompliance with equal employment opportunities and affirmative action requirements.

- e. Authorized to conduct business in Wisconsin. By submitting Bid, bidder warrants that it has: complied with all necessary requirements to do business in State of Wisconsin; that persons executing contract on its behalf are authorized to do so; and, if corporation, that name and address of bidder's registered agent are as set forth in Contract. Bidder shall notify Owner immediately, in writing, of any change in its registered agent, their address, and bidder's legal status. For partnership, term "registered agent" shall mean general partner.
- B. County's Public Works Project Manager will make such investigations as are deemed necessary to determine ability of bidder to perform the Work, and bidder shall furnish to County's Public Works Project Manager or designee all such information and data for this purpose as County's Public Works Project Manager may request. Owner reserves right to reject Bid if evidence submitted by, or investigation of, bidder fails to satisfy Owner that bidder is responsible and qualified to carry out obligations of Contract and to complete the Work contemplated therein.

5. BID GUARANTEE

- A. Bank certified check, cashier's check or Bid Bond, payable to County in amount not less than five percent (5%) of maximum bid, shall accompany each Bid as guarantee that if Bid is accepted, Bidder will execute and return proposed Contract and Performance and Payment Bonds within ten (10) business days after being notified of acceptance of Bid. Company issuing bonds must be licensed to do business in Wisconsin.
- B. Any bid, which is not accompanied by bid guarantee, will be considered "No Bid" and will not be read at Bid Due Date.
- C. If successful Bidder so delivers Contract, Certificate of Insurance, and Performance and Payment Bonds, check will be returned to Bidder. In case Bidder fails to deliver such Contract, insurance, and bond, amount of bid guarantee will be forfeited to County as liquidated damages.
- D. All checks tendered as bid guarantee, except those of three (3) lowest qualified, responsible bidders, will be returned to their makers within three (3) business days after Bid Due Date. All such retained checks will be returned immediately upon signing of Contract and Performance and Payment Bonds by successful Bidder.

6. WITHDRAWAL OF BIDS

- A. Bids may be withdrawn by written request received from bidder or authorized representative thereof prior to time fixed for Bid Due Date, without prejudice to right of bidder to file new Bid. Withdrawn Bids will be returned unopened. Negligence on part of bidder in preparing their Bid confers no right for withdrawal of Bid after it has been opened.
- B. No Bid may be withdrawn for period of sixty (60) calendar days after Bid Due Date.
- C. If Bid contains error, omission or mistake, bidder may limit liability to amount of bidder's guarantee by giving written Notice of Intent not to execute Contract to Owner within seventy-two (72) hours of Bid Due Date.

7. CONTRACT FORM

- A. Sample copy of contract that successful Bidder will be required to enter into is included in these Construction Documents and bidders are required to familiarize themselves with all conditions contained therein.

8. CONTRACT INTERESTS BY COUNTY PUBLIC OFFICIALS

- A. In accordance with Wisconsin Statute 946.13, county official may not bid for or enter into any contract involving receipts or disbursements of more than \$15,000.00 in a year, in which they have private pecuniary interest, direct or indirect if at same time they are authorized to take official action with respect to making of this Contract. Any contract entered into in violation of this Statute is void and County incurs no liability thereon. This subsection does not affect application and enforcement of Wisconsin Statute 946.13 by state prosecutors in criminal courts of this state.

9. EMERGING SMALL BUSINESS PROVISIONS

- A. **Emerging Small Business Definition.** For purposes of this section, ESB is defined as:

1. Independent business concern that has been in business minimum of one year;
2. Business located in State of Wisconsin;
3. Business comprised of less than twenty-five (25) employees;
4. Business must not have gross sales in excess of three million dollars (\$3,000,000.00) over past three years; and
5. Business does not have history of failing to complete projects.

- B. **Emerging Small Business (ESB) Involvement.** Bidder shall make good faith effort to award minimum of ten percent (10%) of the Work to ESBs. Bidder shall submit report to Dane County Contract Compliance Specialist within ten (10) business days of Bid Due Date demonstrating such efforts. Good faith efforts means significant contact with ESBs for purposes of soliciting bids from them. Failure to make or demonstrate good faith efforts will be grounds for disqualification.

- C. **Emerging Small Business Report.** Emerging Small Business Enterprise Report is to be submitted by Bidder in separate envelope marked "Emerging Small Business Report". This report is due by 2:00 p.m. following specified ten (10) business days after Bid Due Date. Bidder who fails to submit Emerging Small Business Report shall be deemed not responsive.

- D. **ESB Goal.** Goal of this project is ten percent (10%) ESB participation. ESB utilizations are shown as percentage of total Bid. If Bidder meets or exceeds specified goal, Bidder is only required to submit Form A - Certification, and Form B - Involvement. Goal shall be met if Bidder qualifies as ESB.

- E. **Report Contents.** Following award of Contract, Bidder shall submit copies of executed contracts for all Emerging Small Businesses. Emerging Small Business Report shall consist of these:

1. Form A - Certification;

2. Form B - Involvement;
 3. Form C - Contacts;
 4. Form D - Certification Statement (if appropriate); and
 5. Supportive documentation (i.e., copies of correspondence, telephone logs, copies of advertisements).
- F. **ESB Listing.** Bidders may solicit bids from the *Dane County Targeted Business Directory* by going to this website. Do not click as a link; copy & paste the address into a web browser.
<https://equity.countyofdane.com/documents/PDFs/Targeted-Business-Directory.xlsx>
- G. **DBE Listing.** Bidders may also solicit bids from the *State of Wisconsin DOT Disadvantaged Business Enterprise Unified Certification Program (DBE / UCP) Directory* by going to this website. These are not only transportation-related designers & contractors. Do not click as a link; copy & paste the address into a web browser.
<https://wisconsin.gov/Documents/doing-bus/civil-rights/dbe/dbe-ucp-directory.xlsx>
- H. **ESB Certification.** All contractors, subcontractors and suppliers seeking ESB certification must complete and submit Emerging Small Business Report to Dane County Contract Compliance Program.
- I. **Certification Statement.** If ESB firm has not been certified by County as ESB prior to submittal of this Bid, ESB Report cannot be used to fulfill ESB goal for this project unless firm provides “Form D - Certification Statement”. Certification statement must be completed and signed by ESB firm.
- J. **Questions.** Questions concerning Emerging Small Business provisions shall be directed to:
OEI@countyofdane.com
or
Dane County Contract Compliance Specialist
City-County Building, Room 356
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
608/266-4192
- K. **Substituting ESBs.** In event of any significant changes in subcontract arrangements or if need arises to substitute ESBs, Bidder shall report such proposed changes to Contract Compliance Specialist to making any official changes and request authorization to substitute ESB firm. Bidder further agrees to make every possible effort to replace ESB firm with another qualified ESB firm.
- L. **Good Faith Efforts.** Good faith efforts can be demonstrated by meeting all of these obligations:
1. Selecting portions of the Work to be performed by ESBs in order to increase likelihood of meeting ESB goal including, where appropriate, breaking down Contract into smaller units to facilitate ESB participation.
 2. Advertising in general circulation, trade associations and women / minority focus media concerning subcontracting opportunities.

3. Providing written notices to reasonable number of specific ESBs that their interest in Contract was being solicited in sufficient time to allow ESBs to participate effectively.
4. Following up on initial solicitations of interest by contacting ESBs within five (5) business days prior to Bid Due Date to determine with certainty whether ESB were interested, to allow ESBs to prepare bids.
5. Providing interested ESB with adequate information about Drawings, Specifications and requirements of Contract.
6. Using services of available minority, women and small business organizations and other organizations that provide assistance in recruitment of MBEs / WBEs / ESBs.
7. Negotiating in good faith with interested ESBs, not rejecting ESBs as unqualified without sound reason based on thorough investigation of their capabilities.
8. Submitting required project reports and accompanying documents to County's Contract Compliance Specialist within twenty-four (24) hours after Bid Due Date.

M. **Appeals Disqualification of Bid.** Bidder who is disqualified may appeal to Public Works & Transportation Committee and Equal Opportunity Commission.

10. METHOD OF AWARD - RESERVATIONS

- A. Following will be basis of award of Contract, providing cost does not exceed amount of funds then estimated by County as available to finance Contract(s):
 1. Lowest dollar amount submitted by qualified responsible bidder on Base Bid for all work comprising project, combined with such additive Owner accepted alternates.
 2. Owner reserves right to reject all bids or any bid, to waive any informality in any bid, and to accept any bid that will best serve interests of County.
 3. Unit Prices and Informational Bids will not be considered in establishing low bidder.

11. SECURITY FOR PERFORMANCE AND PAYMENTS

- A. Simultaneous with delivery of signed Contract, Bidder shall be required to furnish Performance and Payment Bonds as specified in Article 29 of General Conditions of Contract, "Contract Security". Surety Company shall be licensed to do business in Wisconsin. Performance and Payment Bonds must be dated same date or subsequent to date of Contract. Performance and Payment Bonds must emulate information in Sample Performance and Payment Bonds in Construction Documents.
- B. Provide certified copy of power of attorney from Surety Company showing that agent who signs Bond has power of attorney to sign for Surety Company. Secretary or Assistant Secretary of company must sign this certification, not attorney-in-fact. Certification must bear same or later date as Bond. Power of Attorney must emulate model power of attorney information detailed in Sample Performance and Payment Bonds.
- C. If Bidder is partnership or joint venture, State certified list, providing names of individuals constituting partnership or joint venture must be furnished. Contract itself may be signed by

one partner of partnership, or one partner of each firm comprising joint venture, but Performance and Payment Bonds must be signed by all partners.

- D. If Bidder is corporation, it is necessary that current certified copy of resolution or other official act of directors of corporation be submitted showing that person who signs Contract is authorized to sign contracts for corporation. It is also necessary that corporate seal be affixed to resolution, contract, and performance and payment bonds. If your corporation has no seal, it is required that above documents include statement or notation to effect that corporation has no seal.

12. TAXES

- A. Wisconsin Statute 77.54 (9m) allows building materials that become part of local unit government facilities to be exempt from sales & use tax. Vendors & materials suppliers may not charge Bidders sales & use tax on these purchases. This does not include highways, streets or roads. Any other Sales, Consumer, Use & other similar taxes or fees required by law shall be included in Bid.
- B. In accordance with Wisconsin Statute 71.80(16)(a), successful nonresident bidder, whether incorporated or not, and not otherwise regularly engaged in business in this state, shall file surety bond with State of Wisconsin Department of Revenue payable to Department of Revenue, to guarantee payment of income taxes, required unemployment compensation contributions, sales and use taxes and income taxes withheld from wages of employees, together with any penalties and interest thereon. Amount of bond shall be three percent (3%) of Contract or subcontract price on all contracts of \$50,000 or more.

13. SUBMISSION OF BIDS

- A. All Bids shall be submitted on standard Bid Form bound herein and only Bids that are made on this Bid Form will be considered. Entire Bid Form and other supporting documents, if any, shall be removed or copied from Construction Documents, filled out, and submitted in manner specified hereinafter. Submit completed Bid Bond with Bid as well.
- B. No bids for any subdivision or any sub-classification of this Work, except as indicated, will be accepted. Any conditional Bid, amendment to Bid Form or appended item thereto, or inclusion of any correspondence, written or printed matter, or details of any nature other than that specifically called for, which would alter any essential provision of Construction Documents, or require consideration of unsolicited material or data in determining award of Contract, will disqualify Bid. Telecommunication alterations to Bid will not be accepted.
- C. Bidders must submit single Bid for all the Work.
- D. Bid amounts shall be inserted in words and in figures in spaces provided on Bid Form; in case of conflict, written word amounts will govern.
- E. Addenda issued after Bid Letting shall become part of Construction Documents. Bidders shall acknowledge receipt of such addenda in appropriate space provided on Bid Form. Bid may be rejected if receipt of any particular addendum applicable to award of Contract has not been acknowledged on Bid Form.
- F. Bids shall be signed, placed in envelope, sealed and delivered before due time to place designated in Invitation to Bid, and identified with project name, bid number, location, category of work being bid upon, Bid Due Date, name and address of bidder.

- G. Bidder shall be responsible for sealed Bid being delivered to place designated for Bid Due Date on or before date and time specified. Use the “Public Works Bids & Proposals” drop box if you choose to hand deliver. Bids received after time of closing will be rejected and returned to bidder unopened.
- H. Current conditions prevent public bid openings.
- I. Bids dropped off at Public Works’ physical address should be placed in the “Public Works Bids & Proposals” drop box placed outside or just inside the building’s front vestibule.
- J. Bid will be opened on listed due date & time & results should be available within 24 hours at bids-pwht.countyofdane.com.
- K. Bid will be considered invalid and will be rejected if bidder has not signed it.
- L. Faxed or emailed Bids will not be accepted.
- M. Bidder’s organization shall submit completed with Bid, Fair Labor Practices Certification form, included in these Construction Documents.

14. SUBCONTRACTOR LISTING

- N. Bidders are required to submit Section 00 43 36, Proposed Subcontractors Form listing all subcontractors for this project including committed prices for each subcontractor. Project Manager must receive Form no later than when successful Bidder submits their signed Contract. Failure to submit may delay progress payments.

15. ALTERNATE BIDS

- A. Bidder shall carefully read requests for Alternate Bids, and thoroughly examine Drawings and Specifications to determine extent various changes and conditions will affect Bid.
- B. Space is provided in Bid Form for requested Alternate Bids. Failure to submit bid for any requested Alternate Bids may result in rejection of entire Bid.
- C. Bidder shall state amount to be added / subtracted to Base Bid for providing alternates, including all incidentals, omissions, additions, and adjustments as may be necessary or required by such changes. If there is no difference in price, Bidder shall state, “No Change”.
- D. Descriptions of requested Alternate Bids are as set forth in Construction Documents.

16. INFORMATIONAL BIDS

- A. Not Applicable.

17. UNIT PRICES

- A. Not Applicable.

18. COMMENCEMENT AND COMPLETION

- A. Successful Bidder shall commence work when schedule and weather permit, but no later than stated in Bid Form. Contractor shall pursue the Work regularly and continuously at reasonable rate to insure completion of the Work within time stated in Bid.
- B. Should it be found impossible to complete the Work on or before time specified for completion, written request may be submitted for extension of time setting forth reasons believed to justify granting of such request. Refer to Article 20 of General Conditions of Contract, titled "Time for Completion".

19. WORK BY OWNER

- A. This work will be accomplished by Owner or will be let under separate contracts and will not be included under this Contract:
 - 1. Move out & move in staff in construction areas.
 - 2. Test & removal of any asbestos containing materials that may be discovered at the site.
 - 3. Furnish & install furniture, fixtures & equipment (FF&E).
 - 4. Furnish & install project signage.

20. SPECIAL HAZARDS COVERAGE

- A. Not Applicable.

FORM A

**DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION**

In accordance with General Conditions of Contract, submit this Emerging Small Business Report within ten (10) days after Bid Due Date.

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

BIDDER INFORMATION

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE NO.: _____

CONTACT PERSON: _____

EMAIL ADDRESS: _____

FORM B

Page ___ of ___

DANE COUNTY

(Copy this Form as necessary to provide complete information)

EMERGING SMALL BUSINESS REPORT - INVOLVEMENT

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

PHONE NO & EMAIL.: _____

Indicate percentage of financial commitment to this ESB: _____ % Amount: \$ _____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

PHONE NO & EMAIL.: _____

Indicate percentage of financial commitment to this ESB: _____ % Amount: \$ _____

FORM C

Page ___ of ___

DANE COUNTY

(Copy this Form as necessary to provide complete information)

EMERGING SMALL BUSINESS REPORT - CONTACTS

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

	<u>ESB FIRM NAME CONTACTED</u>	<u>DATE</u>	<u>PERSON CONTACTED</u>	<u>DID ESB BID?</u>	<u>ACC- EPT BID?</u>	<u>REASON FOR REJECTION</u>
1)	_____	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____	_____
3)	_____	_____	_____	_____	_____	_____
4)	_____	_____	_____	_____	_____	_____
5)	_____	_____	_____	_____	_____	_____
6)	_____	_____	_____	_____	_____	_____
7)	_____	_____	_____	_____	_____	_____
8)	_____	_____	_____	_____	_____	_____

FORM D

**DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION STATEMENT**

I, _____, _____ of
Name Title

_____ certify to best of my knowledge and
Company

belief that this business meets Emerging Small Business definition as indicated in Article 9 and
that information contained in this Emerging Small Business Report is true and correct.

Bidder's Signature

Date

Name of Bidding Firm: _____

SECTION 00 41 13

BID FORM

BID NO. 320028

**PROJECT: CHILD SUPPORT AGENCY REMODEL - SUITE 365
CITY-COUNTY BUILDING**

**TO: DANE COUNTY DEPARTMENT OF PUBLIC WORKS, HIGHWAY &
TRANSPORTATION PROJECT MANAGER
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713**

**NOTE: WISCONSIN STATUTE 77.54 (9M) ALLOWS FOR NO SALES & USE TAX ON
THE PURCHASE OF MATERIALS FOR COUNTY PUBLIC WORKS PROJECTS.**

BASE BID - LUMP SUM:

Dane County is inviting Bids for construction services to remodel the Child Support Agency offices in the City County Building. The undersigned, having examined the site where the Work is to be executed and having become familiar with local conditions affecting the cost of the Work and having carefully examined the Drawings and Specifications, all other Construction Documents and Addenda thereto prepared by Dane County Department of Public Works, Highway & Transportation hereby agrees to provide all labor, materials, equipment and services necessary for the complete and satisfactory execution of the entire Work, as specified in the Construction Documents, for the Base Bid stipulated sum of:

_____ and __/100 Dollars
Written Price

\$ _____
Numeric Price

Receipt of the following addenda and inclusion of their provisions in this Bid is hereby acknowledged:

Addendum No(s). _____ through _____

Dated _____

Dane County Child Support Agency Division must have this project completed by December 11, 2021. Assuming this Work can be started by July 6, 2021, what dates can you commence and complete this job?

Commencement Date: _____ Completion Date: _____
(final, not substantial)

I hereby certify that all statements herein are made on behalf of:

(Name of Corporation, Partnership or Person submitting Bid)

Select one of the following:

1. A corporation organized and existing under the laws of the State of _____, or
2. A partnership consisting of _____, or
3. A person conducting business as _____;

Of the City, Village, or Town of _____ of the State of _____.

I have examined and carefully prepared this Bid from the associated Construction Documents and have checked the same in detail before submitting this Bid; that I have full authority to make such statements and submit this Bid in (its) (their) (my) behalf; and that the said statements are true and correct. In signing this Bid, we also certify that we have not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a Bid; that this Bid has been independently arrived at without collusion with any other bidder, competitor, or potential competitor; that this Bid has not been knowingly disclosed prior to the Bids Due Date to another bidder or competitor; that the above statement is accurate under penalty of perjury.

The undersigned is qualified as a Best Value Contractor or has proven their exemption. Qualification or exemption shall be complete before Bid Due Date / Time.

The undersigned further agrees to honor the Base Bid and the Alternate Bid(s) for sixty (60) calendar days from date of Award of Contract.

SIGNATURE: _____
(Bid is invalid without signature)

Print Name: _____ Date: _____

Title: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Contact Person: _____

END OF SECTION

THIS PAGE IS FOR BIDDERS' REFERENCE
DO NOT SUBMIT WITH BID FORM.

BID CHECK LIST:

These items **must** be included with Bid:

Bid Form

Bid Bond

Fair Labor Practices Certification

DANE COUNTY BEST VALUE CONTRACTING QUALIFICATION

General Contractors & all Subcontractors must be qualified as a Best Value Contractor with the Dane County Public Works Engineering Division. Qualification & listing is not permanent & must be renewed every 36 months. Complete a *Best Value Contracting Application* online at:

publicworks.countyofdane.com/bvc

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders are strongly encouraged to be a registered vendor with Dane County. Registering allows vendors an opportunity to receive notifications for RFBs & RFPs issued by the County and provides the County with up-to-date company contact information. Complete a new form or renewal online at:

danepurchasing.com/Account/Login?

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SECTION 00 43 36

PROPOSED SUBCONTRACTORS FORM

General Contractor Name: _____ Bid No: 320028

Instructions:

1. Complete all information in table below.
2. Include this Form with signed Construction Contract (Section 00 52 96).
3. General contractors & subcontractors must be qualified & registered as Best Value Contractor (Dane County Ordinances, Chapter 40.07). General contractors must be qualified & registered before bids are due. Subcontractors must be qualified & registered before returning signed Construction Contract to Dane County Public Works. No contractor can perform work without being qualified & registered.
4. Sample Best Value Contracting Application is included in this RFB package for informational purposes; fill out form online (publicworks.countyofdane.com/bvc).

SUBCONTRACTOR NAME	ADDRESS & PHONE NO.	DIVISION OF WORK	\$\$ AMOUNT OF CONTRACT

Check box if there is another form page attached to include additional subcontractors.

The undersigned, for and on behalf of the General Contractor named herein, certifies the information on this Form is accurate.

Officer or Authorized Agent Signature

Date

Printed or Typed Name and Title

COUNTY OF DANE

PUBLIC WORKS CONSTRUCTION CONTRACT

Contract No. _____ Bid No. 320028

Authority: 2020 RES - _____

THIS CONTRACT, made and entered into as of the date by which authorized representatives of both parties have affixed their signatures, by and between the County of Dane (hereafter referred to as "COUNTY") and _____ (hereafter, "CONTRACTOR"), and

WITNESSETH:

WHEREAS, COUNTY, whose address is c/o Deputy Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR provide Child Support Agency Remodel at the City-County Building ("the Project"); and

WHEREAS, CONTRACTOR, whose address is _____ is able and willing to construct the Project, in accordance with the Construction Documents;

NOW, THEREFORE, in consideration of the above premises and the mutual covenants of the parties hereinafter set forth, the receipt and sufficiency of which is acknowledged by each party for itself, COUNTY and CONTRACTOR do agree as follows:

1. CONTRACTOR agrees to construct, for the price of \$ _____ the Project and at the CONTRACTOR'S own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence labor, insurance, and other accessories and services necessary to complete the Project in accordance with the conditions and prices stated in the Bid Form, General Conditions of Contract, the drawings which include all maps, plats, plans, and other drawings and printed or written explanatory matter thereof, and the specifications therefore as prepared by Dorschner Associates, Inc. (hereinafter referred to as "the Architect / Engineer"), and as enumerated in the Project Manual Table of Contents, all of which are made a part hereof and collectively evidence and constitute the Contract.

2. COUNTY agrees to pay the CONTRACTOR in current funds for the performance of the Contract subject to additions and deductions, as provided in the General Conditions of Contract, and to make payments on account thereof as provided in Article entitled, "Payments to Contractor" of the General Conditions of Contract.

3. During the term of this Contract, CONTRACTOR agrees to take affirmative action to ensure equal employment opportunities. The CONTRACTOR agrees in accordance with Wisconsin Statute 111.321 and Chapter 19 of the Dane County Code of Ordinances not to discriminate on the basis of age, race, ethnicity, religion, color, gender, disability, marital status, sexual orientation, national origin, cultural differences, ancestry, physical appearance, arrest record or conviction record, military participation or membership in the national guard, state defense force or any other reserve component of the military forces of the United States, or political beliefs.

Such equal opportunity shall include, but not be limited to, the following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation. CONTRACTOR agrees to post in conspicuous places, available to all employees and applicants for employment, notices setting forth the provisions of this paragraph.

4. CONTRACTOR shall file an Affirmative Action Plan with the Dane County Contract Compliance Specialist in accord with Chapter 19 of the Dane County Code of Ordinances. CONTRACTOR must file such plan within fifteen (15) business days of the effective date of this Contract. During the term of this Contract CONTRACTOR shall also provide copies of all announcements of employment opportunities to COUNTY'S Office of Equity & Inclusion, and shall report annually the number of persons, by race, ethnicity, gender, and disability status, which apply for employment and, similarly classified, the number hired and number rejected.

5. During the term of this Contract, all solicitations for employment placed on CONTRACTOR'S behalf shall include a statement to the effect that CONTRACTOR is an "Equal Opportunity Employer".

6. CONTRACTOR agrees to furnish all information and reports required by COUNTY'S Contract Compliance Specialist as the same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and the provisions of this Contract.

7. This Contract is intended to be a Contract solely between the parties hereto and for their benefit only. No part of this Contract shall be construed to add to, supplement, amend, abridge or repeal existing rights, benefits or privileges of any third party or parties including, but not limited to, employees of either of the parties.

8. The entire agreement of the parties is contained herein and this Contract supersedes any and all oral agreements and negotiations between the parties relating to the subject matter hereof. The parties expressly agree that the express terms of this Contract shall not be amended in any fashion except in writing, executed by both parties.

9. CONTRACTOR must be qualified as a Best Value Contractor or have proven their exemption with Dane County Public Works Engineering Division before Bid Due Date / Time. All contractors and subcontractors must be qualified as a Best Value Contractor or have proven their exemption to perform any work under this Contract.

IN WITNESS WHEREOF, COUNTY and CONTRACTOR, by their respective authorized agents, have caused this Contract and its Schedules to be executed, effective as of the date by which all parties hereto have affixed their respective signatures, as indicated below.

* * * * *

FOR CONTRACTOR:

Signature Date

Printed or Typed Name and Title

Signature Date

Printed or Typed Name and Title

NOTE: If CONTRACTOR is a corporation, Secretary should attest. In accordance with IRS Regulations, unincorporated entities are required to provide either their Social Security or Employer Number in order to receive payment for services rendered.

* * * * *

This Contract is not valid or effectual for any purpose until approved by the appropriate authority designated below, and no work is authorized until the CONTRACTOR has been given notice to proceed by COUNTY'S Deputy Public Works Director.

FOR COUNTY:

Joseph T. Parisi, County Executive Date

Scott McDonell, County Clerk Date

AIA[®] Document A310[™] – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

BOND AMOUNT:**PROJECT:**

(Name, location or address, and Project number, if any)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this _____ day of _____

_____	(Contractor as Principal)	_____	(Seal)
(Witness)	_____	_____	(Title)
_____	(Surety)	_____	(Seal)
(Witness)	_____	_____	(Title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA[®] Document A312[™] – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: None See Section 16

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name _____
and Title: _____

Signature: _____

Name _____
and Title: _____

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

Sample

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

SURETY

Company: _____

(Corporate Seal)

Company: _____

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.



AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312-2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: None See Section 18

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name _____
and Title: _____

Signature: _____

Name _____
and Title: _____

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:**OWNER'S REPRESENTATIVE:**

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____

(Corporate Seal)

SURETY

Company: _____

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

SECTION 00 72 12

GENERAL CONDITIONS OF CONTRACT

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1. CONSTRUCTION DOCUMENTS

- A. Construction Documents, listed in Table of Contents of this Specification volume shall form part of this Contract and provisions of Construction Documents shall be as binding upon parties as if they were fully set forth in Contract itself.
- B. These shall also be considered as part of Construction Documents: Addenda, including additions and modifications incorporated in such addenda before execution of Contract; requests for information; construction bulletins; change orders; and written interpretations by Architect / Engineer or Public Works Project Manager that are made after execution of Contract.
- C. Construction Documents are complementary, and what is required by one shall be as binding as if required by all. Intent of Construction Documents is to include all labor, materials and equipment necessary for proper execution of the Work.

2. DEFINITIONS

- A. These terms as used in this Contract are respectively defined as follows:
 - 1. All uses of term “County” in Construction Documents shall mean Dane County.
 - 2. All uses of term “Department” in Construction Documents shall mean Department of Public Works, Highway & Transportation, which is a unit of Dane County government. Department is County agency overseeing Contract with Contractor.
 - 3. Public Works Project Manager is appointed by and responsible to Department. Public Works Project Manager has authority to act on behalf of Department and will sign change orders, payment requests and other administrative matters related to projects.
 - 4. Public Works Project Manager is responsible for supervision, administration and management of field operations involved in construction phase of this Work.
 - 5. Term “Work” includes all labor, equipment and materials necessary to produce project required by Construction Documents.
 - 6. Term “Substantial Completion” is date when project or specified area of project is certified by Architect / Engineer that construction is sufficiently completed, in accordance with Construction Documents, and as modified by any subsequent changes agreed to by parties, so that County may occupy project or specified area of project for use for which it was intended subject to permit approval for occupancy.
 - 7. Contractor is person, firm, or corporation with whom County makes Contract. Though multiple contracts may be involved, Construction Documents treat them throughout as if each were of singular number.

3. ADDITIONAL INSTRUCTIONS AND DRAWINGS

- A. Contractor may be furnished additional instructions and detail drawings as necessary to carry out the Work included in Contract. Additional drawings and instructions thus supplied to Contractor will coordinate with Construction Documents and will be so prepared that they can be reasonably interpreted as part thereof. Contractor shall carry out the Work in accordance with additional detail drawings and instructions.

4. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Unless otherwise specified, Contractor shall submit three (3) copies of all Shop Drawings for each submission, until receiving final approval. After final approval, provide five (5) additional copies for distribution and such other copies as may be required.

- B. Contractor shall submit, on an on-going basis and as directed, Product Data such as brochures that shall contain catalog cuts and specifications of all furnished mechanical and electrical equipment. After Architect / Engineer's approval, one (1) copy shall remain in Architect / Engineer's file, one (1) kept at Department's office and one (1) kept at job site by Contractor for reference purposes.
- C. Samples shall consist of physical examples furnished by Contractor in sufficient size and quantity to illustrate materials, equipment or workmanship, and to establish standards to compare the Work.
 - 1. Submit Samples in sufficient quantity (minimum of two (2)) to permit Architect / Engineer to make all necessary tests and of adequate size showing quality, type, color range, finish, and texture. Label each Sample stating material, type, color, thickness, size, project name, and Contractor's name.
 - 2. Submit transmittal letter requesting approval, and prepay transportation charges to Architect / Engineer's office on samples forwarded.
 - 3. Materials installed shall match approved Samples.
- D. Contractor shall review Shop Drawings and place their dated stamp thereon to evidence their review and approval and shall submit with reasonable promptness and in orderly sequence to cause no delay in the Work or in work of any other contractor. At time of submission, Contractor shall inform Architect / Engineer in writing of any deviation in Shop Drawings or Samples from requirements of Construction Documents. Architect / Engineer will not consider partial lists.
- E. Architect / Engineer will review and approve or reject Shop Drawings with reasonable promptness to cause no delay. Architect / Engineer's approval shall not relieve Contractor from responsibility for errors or omissions in Shop Drawings.
- F. Contractor shall not commence any work requiring Shop Drawing, Product Data or Sample submission until Architect / Engineer has approved submission. All such work shall be in accordance with approved Shop Drawings, Product Data and Samples.
- G. Contractor shall keep on site of the Work, approved or conformed copy of Shop Drawings and shall at all times give Department access thereto.
- H. By stamping and submitting Shop Drawings, Product Data and Samples, Contractor thereby represents that he or she has or will determine and verify all field measurements, field construction criteria, materials, catalog numbers, and similar data and that he or she has checked and coordinated each Shop Drawing, Product Data and Sample with requirements of the Work and of Construction Documents. Architect / Engineer shall return without examination, Shop Drawings, Product Data and Samples not so noted.
- I. All Shop Drawings from any one Contractor should be numbered consecutively and on cover sheet shall bear name and location of project, name of Contractor, date of submittal and date of each correction or revision and associated Specification section and page number.

5. CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

- B. Contractor shall not damage or endanger portion of the Work or fully or partially completed construction of County or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. Contractor shall not cut or otherwise alter such construction by County or separate contractor except with written consent of County and of such separate contractor; such consent shall not be unreasonably withheld. Contractor shall not withhold unreasonably from County or separate contractor, Contractor's consent to cutting or otherwise altering the Work.

6. CLEANING UP

- A. Contractor shall keep premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under Contract. Contractor shall remove from and about the Work waste materials, rubbish, Contractor's tools, construction equipment, machinery, and surplus materials at completion of the Work. Contractor shall maintain streets and sidewalks around the Work site in clean condition. Contractor shall remove all spillage and prevent tracking of spillage arising from performance of the Work, into, out of, and within the Work site. Contractor shall establish regular maintenance program of sweeping, vacuuming and / or hosing to minimize accumulation of dirt and dust upon such areas.
- B. If Contractor fails to clean up as directed in Construction Documents, County may do so and shall charge Contractor cost thereof.
- C. Contractor shall be responsible for broken windows and glass, and at completion of the Work shall replace such damaged or broken windows and glass. After replacing damaged or broken windows and glass, Contractor shall remove all labels, wash and polish both sides of all windows and glass.
- D. In addition to general cleaning (sweeping, vacuuming and / or hosing, as is appropriate to work surface), Contractor shall perform following final cleaning for all trades at completion of the Work:
 - 1. Remove temporary protections;
 - 2. Remove marks, stains, fingerprints and other soil or dirt from painted, decorated and finished woodwork and wall surfaces;
 - 3. Remove spots, plaster, soil and paint from ceramic tile, marble and other finished materials, and wash or wipe clean;
 - 4. Clean fixtures, cabinet work and equipment, removing stains, paint, dirt and dust, and leave same in undamaged, new condition;
 - 5. Clean aluminum in accordance with recommendations of manufacturer; and
 - 6. Clean resilient floors thoroughly with well-rinsed mop containing only enough moisture to clean off any surface dirt or dust and buff dry by machine to bring surfaces to sheen.

7. USE OF SITE

- A. Contractor shall provide County and Architect / Engineer access to the Work under all circumstances.
- B. Contractor shall confine operations at site to areas permitted by County, law, ordinance, permits and Construction Documents and shall not unreasonably encumber site with materials or equipment. Contractor shall assure free, convenient, unencumbered, direct and safe access to all properties adjacent to the Work for County, its employees, invitees and guests.

- C. Contractor & subcontractors shall follow all current *Public Health - Madison & Dane County* procedures & recommendations including the mandatory use of face masks while inside any County facility. County Project Manager shall clarify these procedures & recommendations at pre-construction meeting.

8. MATERIALS AND WORKMANSHIP

- A. Contractor shall perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, necessary to complete the Work required by this Contract, within time specified, in accordance with provisions of Construction Documents.
- B. All equipment and materials incorporated in the Work covered by this Contract are to be new; use recycled and / or recovered materials to extent that such use is technically and economically feasible. Recovered materials are products recovered from solid waste in form identical to original form for use that is same as, or similar to original use. Recycled materials are products manufactured from solid waste.
- C. If requested, Contractor shall furnish satisfactory evidence as to kind and quality of construction materials proposed or used. Contractor shall furnish to Architect / Engineer, for approval, manufacturer name and model, performance capacities and other pertinent information of machinery, mechanical, electrical or other types of equipment, which Contractor plans to install.
- D. If not otherwise provided, materials and labor called for in this Contract shall be provided and performed in accordance with established practice and standards recognized by Architects, Engineers, Department, and construction industry.
- E. Reference to “Standard” specifications of any association or manufacturer, or codes of County authorities, intends most recent printed edition or catalog in effect on date that corresponds with date of Construction Documents.
- F. Whenever reference is made in Specifications that work shall be “performed”, “applied”, in accordance with “manufacturer’s directions or instructions”, Contractor to whom those instructions are directed shall furnish three (3) printed copies of such instructions to Architect / Engineer before execution of the Work.

9. CONTRACTOR’S TITLE TO MATERIALS

- A. Contractor or any subcontractor shall not purchase materials or supplies for the Work subject to any chattel mortgage or under conditional sale contract or other agreement by which seller retains interest. Contractor warrants that all materials and supplies used in the Work are free from all liens, claims or encumbrances and Contractor has good title to them.

10. “OR EQUAL” CLAUSE

- A. Whenever equipment or materials are identified on Drawings or in Specifications by reference to manufacturer’s or vendor’s name, trade name, catalog number, and other identifying information, it is intended to establish standards; and any equipment or material of other manufacturers and vendors which will perform adequately duties imposed by general design will be considered equally accepted provided equipment or material so proposed is, in opinion of Architect / Engineer, of equal substance and function. Architect / Engineer and Department shall provide written approval before Contractor may purchase or install it.

- B. Equipment or materials of manufacturers, other than those named, may be used only upon following conditions:
1. That, in opinion of Architect / Engineer and Department, proposed material or equipment item is fully equal or superior (in design, materials, construction, workmanship, performance, finish, etc.) to named item. No compromise in quality level, however small, is acceptable.
 2. That, in substituting materials or equipment, Contractor assumes responsibility for any changes in system or for modifications required in adjacent or related work to accommodate such substitution despite Architect / Engineer's and Department's approval, and all costs growing out of approval of "or equal" items shall be responsibility of Contractor. No extra costs resulting from such approval shall become responsibility of Department, Architect / Engineer or any other separate Contractor.
 3. It shall be understood that use of materials or equipment other than those specified, or approved equal by Architect / Engineer and Department, shall constitute violation of Contract, and that Architect / Engineer and Department shall have right to require removal of such materials or equipment and their replacement with specified materials or equipment at Contractor's expense.
 4. Product and manufacturer named first in Specifications or on information shown on Drawings is basis of selection of manufactured items and equipment, particularly mechanical equipment. In using other than first named products or manufacturers, including those specified as additionally approved or acceptable, Contractor assumes responsibility for any changes in system and for modifications in any work required to accommodate them. Architect / Engineer's approval of such additionally acceptable products or manufacturers, either in Specifications or in Addendum, does not relieve Contractor from obligation to coordinate such optional products with other Contractors, whose work may be affected by them, and to pay all additional costs resulting from their inclusion into the Work. Contractor's liability shall include payment of Architect / Engineer's fees for any additional services made necessary by or directly connected to such product changes. No extra costs resulting from such changes shall become responsibility of Department, Architect / Engineer or any other separate Contractor.
- C. No request for approval of "or equal" materials will be entertained except from Contractor. Identify any request for substitution as substitution on Contractor's letter of transmittal and give reasons for substitution. Department may in its sole discretion allow substitutions of materials.

11. PATENTS AND ROYALTIES

- A. If Contractor uses any design, device or material covered by letters, patent or copyright, it is mutually agreed and understood, that, without exception, contract prices shall include all royalties or costs arising from use of such design, device or materials, in any way involved in the Work.
- B. Contractor shall indemnify and save harmless County from any and all claims for infringement by reason of use of such patent or copyright in connection with the Work agreed to be performed under this Contract, and shall indemnify County for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during prosecution of the Work or after completion of the Work.

12. SURVEYS, PERMITS, REGULATIONS AND TAXES

- A. Department will furnish to Contractor all site, topography and property surveys necessary for execution of the Work.
- B. Contractor shall procure all permits, licenses and approvals necessary for execution of this Contract.
- C. Contractor shall give all notices and comply with all State of Wisconsin, Federal and local laws, codes, rules and regulations relating to performance of the Work, protection of adjacent property, and maintenance of passageways, guard fences or other protective facilities.
- D. Contractor does not need to pay State and local sales & use taxes on building materials that become part of local unit government facilities. See Wisconsin Statute 77.54 (9m). This does not include materials for highways, streets or roads. Contractor shall pay any other Sales, Consumer, Use & other similar taxes or fees required by law.
- E. Contractor shall promptly notify Architect / Engineer of any variances of Drawings or Specifications with that of any State of Wisconsin, federal or local law, code, rule or regulation. Upon such notification, Architect / Engineer will require correction of variance to comply with applicable law, code, rule or regulation at no additional cost to Contractor.
- F. Work under this Contract shall comply with all applicable State of Wisconsin, Federal and local laws, codes and regulations.
- G. Contractor shall pay charges for water, sewer and other utility connections made by municipalities where required by Specifications.

13. CONTRACTOR'S OBLIGATIONS AND SUPERINTENDENCE

- A. Contractor shall provide and pay for all materials, labor, tools, equipment, transportation and superintendence necessary to execute, complete and deliver the Work within specified time. Contractor agrees to secure at their own expense all personnel necessary to carry out the Work. Such personnel shall not be deemed County employees nor shall they have or be deemed to have any direct contractual relationship with County.
- B. Performance of any work necessary after regular working hours, on Sundays or Legal Holidays shall be without additional expense to County. Performance of any work at site at other than normal working hours must be coordinated with Public Works Project Manager.
- C. Contractor shall furnish, erect, maintain and remove such temporary works as may be required.
- D. Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of Construction Documents.
- E. At the Work site, Contractor shall give personal superintendence to the Work or shall employ construction superintendent or foreman, experienced in character of work covered by Contract, who shall have full authority to act for Contractor. Understand that such superintendent or foreman shall be acceptable to Architect / Engineer and Department.

- F. Remove from project or take other corrective action upon notice from Architect / Engineer or Department for Contractor's employees whose work is considered by Architect / Engineer or Department to be unsatisfactory, careless, incompetent, unskilled or otherwise objectionable.
- G. Contractor and subcontractors shall be required to conform to Labor Laws of State of Wisconsin and various acts amendatory and supplementary thereto and to other laws, ordinances and legal requirements applicable to the Work.
- H. Presence and observation of the Work by Architect / Engineer or Public Works Project Manager shall not relieve Contractor of any obligations.

14. WEATHER CONDITIONS

- A. In event of temporary suspension of work, or during inclement weather, or whenever Architect / Engineer shall direct, Contractor shall, and shall cause subcontractors to protect carefully all work and materials against damage or injury from weather. If, in opinion of Architect / Engineer or Department, any work or materials that have been damaged or injured due to failure on part of Contractor or any subcontractors so to protect the Work, such materials shall be removed and replaced at expense of Contractor.

15. PROTECTION OF WORK AND PROPERTY

- A. Contractor shall at all times safely guard County's property from injury or loss in connection with this Contract. Contractor shall at all times safely guard and protect the Work, and adjacent property, from damage. Contractor shall replace or make good any such damage, loss or injury unless such is caused directly by errors contained in Contract, or by County, or County's duly authorized representative.
- B. Contractor may act diligently, without previous instructions from Architect / Engineer and / or Department, in emergency that threatens loss or injury of property, or safety of life. Contractor shall notify Architect / Engineer and / or Department immediately thereafter. Promptly submit any claim for compensation by Contractor due to such extra work to Architect / Engineer and / or Department for approval as provided for in Article 18 herein.

16. INSPECTION AND TESTING OF MATERIALS

- A. Authorized representatives and agents of County government shall have access at all times to the Work wherever it is in preparation or progress and Contractor shall provide facilities for such access and for inspection.
- B. Should it be considered necessary or advisable at any time before final acceptance of the Work to make examination of work already completed, by removing or tearing out same, Contractor shall upon request, promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any aspect, due to fault of Contractor or subcontractors thereof, Contractor shall assume all expenses of such examination and of satisfactory reconstruction. Contractor will be reimbursed for such examination and replacement in accordance with Article 18 - A.3., of these General Conditions of Contract if such work is found to meet requirements of Contract.
- C. If Specifications, Architect / Engineer's, or Public Works Project Manager's instructions require any work to be specially tested or approved, Contractor shall give Architect / Engineer and Public Works Project Manager timely notice of its readiness for testing or

inspection. Test all materials and equipment requiring testing in accordance with accepted or specified standards, as applicable. Architect / Engineer shall recommend laboratory or inspection agency and Department will select and pay for all initial laboratory inspection services. Should retesting be required, due to failure of initial testing, cost of such retesting shall be borne by Contractor.

- D. Cost of any testing performed by manufacturers or Contractor for substantiating acceptability of proposed substitution of materials and equipment, or necessary conformance testing in conjunction with manufacturing processes or factory assemblage, shall be borne by Contractor or manufacturer responsible.

17. REPORTS, RECORDS AND DATA

- A. Contractor shall submit to Architect / Engineer and Public Works Project Manager such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, invoices, records and other data as either may request concerning work performed or to be performed under this Contract.

18. CHANGES IN THE WORK

- A. Make no changes, except in cases of emergency, in the Work covered by approved Construction Documents without having prior written approval of Department. Charges or credits for the Work covered by approved change shall be determined by one of these methods:
1. Unit bid prices previously approved.
 2. Agreed lump sum based on actual cost of:
 - a) Labor, including foremen, and all fringe benefits that are associated with their wages.
 - b) Materials entering permanently into the Work.
 - c) Ownership or rental cost of construction tools and equipment during time of use on extra work.
 - d) Power and consumable supplies for operation of power equipment.
 - e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
 - f) Social Security and old age and unemployment contributions.
 - g) Add to cost under (2), fixed fee to be agreed upon, but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit and any other general expense.
 - h) On that portion of the Work under (2) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit and any other general expense.
 - i) Department may require correct amount of costs with supporting vouchers; Contractor shall keep and present in such form as directed.
 3. Cost-plus work, with not-to-exceed dollar limit, based on actual cost of:
 - a) Labor, including foremen, and all fringe benefits that are associated with their wages.
 - b) Materials entering permanently into the Work.
 - c) Ownership or rental cost of construction tools and equipment during time of use on extra work. Rental cost cannot exceed fifty percent (50%) replacement value of rented equipment.
 - d) Power and consumable supplies for operation of power equipment.
 - e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
 - f) Social Security and old age and unemployment contributions.

- g) To cost under (3), there shall be added fixed fee to be agreed upon but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit, and any other general expense.
 - h) On that portion of the Work under (3) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit, and any other general expense.
 - i) Contractor shall keep and present, in such form as directed, correct amount of cost together with such supporting vouchers as may be required by Department.
- B. If Contractor claims that by any instructions given by Architect / Engineer, Department, by drawings or otherwise, regarding performance of the Work or furnishing of material under Contract, involves extra cost, Contractor shall give Department written notice of cost thereof within two (2) weeks after receipt of such instructions and in any event before proceeding to execute work, unless delay in executing work would endanger life or property.
- C. No claim for extra work or cost shall be allowed unless it was done in pursuance of written Change Order from Architect / Engineer and approved by Department, as previously mentioned, and claim presented with payment request submitted after changed or extra work is completed.
- D. Negotiation of cost for change in the Work shall not be cause for Contractor to delay prosecution of the Work if Contractor has been authorized in writing by Public Works Project Manager to proceed.

19. EXTRAS

- A. Without invalidating Contract, Department may order extra work or make changes by altering, adding to or deducting from the Work, contract sum being adjusted in accordance with Article 18 herein.

20. TIME FOR COMPLETION

- A. Contractor agrees that the Work shall be prosecuted regularly and diligently and complete the Work as stated in Construction Documents.

21. CORRECTION OF WORK

- A. All work, all materials whether incorporated in the Work or not, and all processes of manufacture shall at all times and places be subject to inspection of Architect / Engineer and Public Works Project Manager who shall be judge of quality and suitability of the Work, materials, and processes of manufacture for purposes for which they are used. Should they fail to meet Architect / Engineer's and Public Works Project Manager's approval they shall be reconstructed, made good, replaced or corrected, by Contractor at Contractor's expense. Immediately remove all rejected material from site.
- B. If Contractor defaults or neglects to carry out the Work in accordance with Construction Documents or fails to perform any provision of Contract, Department may, after ten (10) business days' written notice to Contractor and without prejudice to any other remedy County may have, make good such deficiencies. In such case, appropriate Change Order shall be issued deducting from Contractor's payments then or thereafter, cost of correcting such

deficiencies, including cost of Architect / Engineer's additional services made necessary by such default, neglect or failure.

22. SUBSURFACE CONDITIONS FOUND DIFFERENT

- A. If Contractor encounters subsurface or latent conditions at site materially differing from those shown on Drawings or indicated in Specifications, Contractor shall immediately give notice to Architect / Engineer and Public Works Project Manager of such conditions before they are disturbed. Architect / Engineer will thereupon promptly investigate conditions, and if Architect / Engineer finds that they materially differ from those shown on Drawings or indicated in Specifications, Architect / Engineer will at once make such changes as necessary, any increase or decrease of cost resulting from such changes to be adjusted in manner provided in above Article 18 entitled "Changes in the Work".

23. RIGHT OF DEPARTMENT TO TERMINATE CONTRACT

- A. In event that any provisions of this Contract are violated by Contractor or by any subcontractors, County may serve written notice upon Contractor and Surety of its intention to terminate Contract, such notice to contain reasons for such intention to terminate Contract, and unless within ten (10) business days after serving of such notice upon Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, Contract shall, upon expiration of said ten (10) business days, cease and terminate.
- B. In event of any such termination, County shall immediately serve notice thereof upon Surety and Contractor, and Surety shall have right to take over and perform Contract subject to County's approval; provided, however, that if Surety does not commence performance thereof within ten (10) business days from date of mailing to such Surety of notice of termination, County may take over the Work and prosecute same to completion by contract, or by force account, at expense of Contractor; Contractor and Surety shall be liable to County for any excess cost occasioned County thereby, and in such event County may take possession of and utilize in completing the Work, such materials and equipment as may be on the Work site and therefore necessary.

24. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

- A. Contractor shall be responsible for Construction Schedule and coordination. Immediately after execution and delivery of Contract and before making first payment, Contractor shall notify all subcontractors to furnish all required information to develop Construction Schedule. Contractor and all subcontractors associated with the Work shall furnish following information from each Division of Specifications:
1. List of construction activities;
 2. Start, finish and time required for completion of each activity;
 3. Sequential relationships between activities;
 4. Identify all long lead-time items, key events, meetings or activities such as required submittals, fabrication and delivery, procurement of materials, installation and testing;
 5. Weekly definition of extent of work and areas of activity for each trade or Subcontract; and
 6. Other information as determined by Public Works Project Manager.
- B. In addition to above requested items, Contractor shall request delivery dates for all County-furnished equipment, materials or labor. This shall include any work handled by Department

under separate contracts such as asbestos abatement, air and water balancing, etc. Indicate on Construction Schedule these associated delivery and installation dates.

C. Progress Reporting:

1. Contractor shall update and publish Construction Schedule on monthly basis. Revisions to Schedule shall be by Contractor and made in same detail as original Schedule and accompanied by explanation of reasons for revision; and shall be subject to approval by Department.
2. Failure of Contractor to keep Schedule in updated format shall result in County hiring firm specializing in construction schedule development and deducting those costs associated with updating process from payments due Contractor.
3. Contractor shall submit show actual percentage of each activity completed, estimated future progress, and anticipated completion time.

D. Responsibility for timely completion requires:

1. Contractor and subcontractors understand that performance of each is interdependent upon performance of others.
2. Whenever it becomes apparent from current schedule, that phasing or progress completion dates will not be met, Contractor must take some or all following actions at no additional cost to County:
 - a) Increase construction labor in such quantities and crafts as will eliminate backlog of work.
 - b) Increase number of working hours per shift, shifts per working day, working days per week, amount of construction equipment, or any combination of foregoing to eliminate backlog of work.
 - c) Reschedule work (yet remain in conformance with Drawings and Specifications).
3. Prior to proceeding with any of above actions, Contractor shall notify Public Works Project Manager.

E. Maintain current Construction Schedule at all times. Revise Construction Schedule in same detail as original and accompany with explanation of reasons for revision. Schedule shall be subject to approval by Architect / Engineer and Public Works Project Manager.

25. PAYMENTS TO CONTRACTOR

A. Contractor shall provide:

1. Detailed estimate giving complete breakdown of contract price by Specification Division; and
2. Periodic itemized estimates of work done for purpose of making partial payments thereon.

B. Submit these estimates for approval first to Architect / Engineer, then to Public Works Project Manager. Costs employed in making up any of these schedules are for determining basis of partial payments and not considered as fixing basis for additions to or deductions from Contract price.

C. County will make partial payments to Contractor for value, proportionate to amount of Contract, of all labor and material incorporated in the Work during preceding calendar month upon receipt of Application and Certificate for Payment form from Architect / Engineer and approval of Department.

D. Contractor shall submit for approval first to Architect / Engineer, and then to Public Works Project Manager all Application and Certificate for Payment forms. If requested, Application

and Certificate for Payment shall be supported by such additional evidence as may be required, showing Contractor's right to payment claimed.

- E. Application and Certificate for Payment for preparatory work and materials delivered and suitably stored at site to be incorporated into the Work at some future period, will be given due consideration. Requesting payment for materials stored off site, may be rejected, however, if deemed essential for reasons of job progress, protection, or other sufficient cause, requests will be considered, conditional upon submission by Contractor of bills of sale, photographs and such other procedures as will adequately protect County's interest such as storage in bonded warehouse with adequate coverage. If there is any error in payment, Contractor is obligated to notify Department immediately, but no longer than ten (10) business days from receipt of payment.
- F. Payments by County will be due within forty-five (45) business days after receipt by Department of Application and Certificate for Payment.
- G. County will retain five percent (5%) of each Application and Certificate for Payment until final completion and acceptance of all the Work covered by Contract. However, anytime after fifty percent (50%) of the Work has been furnished and installed at site, County will make remaining payments in full if Architect / Engineer and Public Works Project Manager find that progress of the Work corresponds with Construction Schedule. If Architect / Engineer and Public Works Project Manager find that progress of the Work does not correspond with Construction Schedule, County may retain up to ten percent (10%) of each Application and Certificate for Payment for the Work completed.
- H. All material and work covered by partial payments made shall become sole property of County, but this provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made, or restoration of any damaged work, or as waiver of right of County to require fulfillment of all of terms of Contract.
- I. County will make final payment within sixty (60) calendar days after final completion of the Work, and will constitute acceptance thereof.
- J. County may make payment in full, including retained percentages and less authorized deductions, upon completion and acceptance of each Division where price is stated separately in Contract.
- K. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit to this Department, as requested and with final application for payment for work under said contract, affidavit(s) as required to prove that all debts and claims against this Work are paid in full or otherwise satisfied, and give final evidence of release of all liens against the Work and County.

26. WITHHOLDING OF PAYMENTS

- A. County, after having served written notice on said Contractor, may either pay directly any unpaid bills of which Department has written notice, or withhold from Contractor's unpaid compensation sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged; whereupon, payment to Contractor shall be resumed in accordance with terms of this Contract, but in no event shall these provisions be construed to impose any obligations upon County to either Contractor or Contractor's Surety.

- B. In paying any unpaid bills of Contractor, County shall be deemed agent of Contractor, and any payment so made by County, shall be considered as payment made under Contract by County to Contractor and County shall not be liable to Contractor for any such payment made in good faith.
- C. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from all claims growing out of lawful demands of subcontractors, laborers, workers, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in performance of this Contract.
- D. At Department's request, Contractor shall furnish satisfactory evidence that all obligations of nature designated above have been paid, discharged or waived.

27. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

- A. Making of final payment shall constitute waiver of all claims by County except those arising from:
 - 1. Unsettled lien;
 - 2. Faulty or defective work appearing after substantial completion;
 - 3. Failure of the Work to comply with requirements of Construction Documents; or
 - 4. Terms of any special guarantees required by Construction Documents.
- B. Acceptance of final payment shall constitute waiver of all claims by Contractor.

28. PAYMENTS BY CONTRACTOR

- A. Contractor shall pay following not later than fifth (5th) business day following each payment received from County:
 - 1. All transportation and utility services rendered;
 - 2. All materials, tools, and other expendable equipment that have been delivered at site of the Work to extent of ninety percent (90%) of cost thereof, and balance of cost thereof when said balance is paid to Contractor; and
 - 3. Each subcontractor, respective amount allowed Contractor because of work performed by subcontractor to extent of subcontractor's interest therein.

29. CONTRACT SECURITY

- A. Contractor shall furnish Performance and Payment Bonds in amount at least equal to one hundred percent (100%) of Contract price as security for faithful performance of this Contract and payment of all persons performing labor on project under this Contract and furnishing materials in connection with this Contract.
- B. Sample Performance and Payment Bonds that Contractor will be required to execute is bound into these Construction Documents. Before construction Contract is consummated, completed Performance and Payment Bonds must be approved by Department.

30. ASSIGNMENTS

- A. Contractor shall not assign whole or any part of this Contract or any moneys due or to become due hereunder without written consent of Department. In case Contractor assigns all

or any part of any moneys due or to become due under this Contract, instrument of assignment shall contain clause substantially to effect that it is agreed that right of assignee in and to any moneys due or to become due to Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for performance of the Work called for in this Contract.

31. MUTUAL RESPONSIBILITY OF CONTRACTORS

- A. If, through acts of neglect on part of Contractor or any subcontractor shall suffer loss or damage on the Work, Contractor agrees to settle with such subcontractor by agreement or arbitration if such other subcontractor will so settle. If such subcontractor shall assert any claim against County on account of any damage alleged to have been sustained, Department shall notify Contractor, who shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives against any such claim.

32. SEPARATE CONTRACTS

- A. Department may award other contracts for the Work and all Contractors shall fully cooperate with each other and carefully adjust their work to that provided under other contracts as may be directed by Department. No Contractor shall commit or permit any act that will interfere with performance of the Work by any other Contractor.
- B. Contractor shall coordinate the Work with those of other Contractors. Cooperation will be required in arrangement for storage of materials and in detailed execution of the Work. Contractor, including subcontractors, shall keep informed of progress and detail work of others and shall notify Architect / Engineer or Department immediately of lack of progress or defective workmanship on part of others. Failure of Contractor to keep informed of the Work progressing on site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by Contractor of status of the Work as being satisfactory for proper coordination with Contractor's own work.

33. SUBCONTRACTS

- A. Contractor may use services of specialty subcontractors on those parts of the Work that, under normal contracting practices, are performed by specialty subcontractors.
- B. Contractor shall not award any work to any subcontractor without prior approval of Department. Qualifications of subcontractors shall be same as qualifications of Contractor. Request for subcontractor approval shall be submitted to Department fifteen (15) business days before start of subcontractor's work. If subcontractors are changed or added, Contractor shall notify Department in writing.
- C. Contractor shall be as fully responsible to County for acts and omissions of subcontractors, and of persons either directly or indirectly employed by them, as Contractor is for acts and omissions of persons directly employed by Contractor.
- D. Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to Contractor by terms of General Conditions of Contract and other Construction Documents insofar as applicable to work of subcontractors and to give Contractor same power as regards terminating any subcontract that Department may exercise over Contractor under any provision of Construction Documents.

- E. Nothing contained in this Contract shall create any contractual relation between any subcontractor and County.
- F. Contractor shall insert in all subcontracts, Articles 26, 33, 43 and 45, respectively entitled: “Withholding of Payments”, “Subcontracts”, “Affirmative Action Provision and Minority / Women / Disadvantaged Business Enterprises”, and “Minimum Wages”, and shall further require all subcontractors to incorporate physically these same Articles in all subcontracts.

34. PROJECT MANAGER’S AUTHORITY

- A. Public Works Project Manager shall:
 - 1. Administer and ensure compliance with Construction Documents;
 - 2. Provide responsible on-site observations of construction and have authority to request work and to stop work whenever necessary to insure proper enforcement of Construction Documents;
 - 3. Convene and chair project meetings and foreman’s coordination meetings when necessary to coordinate resolution of conflicts between Contractors, Architects, Engineers, Consultants, and Department; and
 - 4. Check and inspect material, equipment and installation procedures of all trades for proper workmanship and for compliance with Drawings, Specifications and Shop Drawings, permit no material on project site that is not satisfactory and reject work not in compliance with Construction Documents.

35. CONSULTANT’S AUTHORITY

- A. Architect / Engineer is retained by, and is responsible to Department acting for County.
- B. Architect / Engineer shall determine amount, quality, acceptability, and fitness of several kinds of work and materials that are provided under this Contract and shall decide all questions that may arise in relation to said work and construction thereof.
- C. Architect / Engineer shall decide meaning and intent of any portion of Specifications and of any Drawings where they may be found obscure or be in dispute.
- D. Architect / Engineer shall provide responsible observation of construction. Architect / Engineer has authority to stop the Work whenever such stoppage may be necessary to insure proper execution of Construction Documents.
- E. Architect / Engineer shall be interpreter of conditions of Construction Documents and judge of its performance.
- F. Within reasonable time, Architect / Engineer shall make decisions on all matters relating to progress of the Work or interpretation of Construction Documents.
- G. Architect / Engineer’s decisions are subject to review by Public Works Project Manager.

36. STATED ALLOWANCES

- A. Stated allowances enumerated in Instructions to Bidders shall cover net cost of materials or equipment, and all applicable taxes. Contractor’s cost of delivery and unloading at site,

handling costs on site, labor, installation costs, overhead, profit and any other incidental costs shall be included in Contractor's bid, but not as part of cash allowance.

- B. Department will solicit at least two (2) bids on materials or equipment for which allowance is stated and select on basis of lowest qualified responsible bid. Contractor will then be instructed to purchase "Allowed Materials". If actual price for purchasing "Allowed Materials", including taxes, is more or less than "Cash Allowance", Contract price shall be adjusted accordingly. Adjustment in Contract price shall not contain any cost items excluded from cash allowance.

37. ESTIMATES OF QUANTITIES

- A. Whenever estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of Construction Documents, they are given for use in comparing bids and right is especially reserved to increase or diminish them as they may be deemed reasonably necessary or desirable by Department to complete the Work included in this Contract, and cost for such increase or diminution shall be adjusted in manner provided for in General Conditions of Contract Article 18 entitled "Changes in the Work".

38. LANDS AND RIGHTS-OF-WAY

- A. Prior to start of construction, County shall furnish all land and rights-of-way necessary for carrying out and completion of the Work to be performed under this Contract.

39. GENERAL GUARANTEE

- A. Neither final certificate of payment nor any provision in Construction Documents nor partial or entire occupancy of premises by County shall constitute acceptance of work not done in accordance with Construction Documents or relieve Contractor of liability in respect to any expressed warranties or responsibility for faulty materials or workmanship.
 - 1. In no event shall making of any payment required by Contract constitute or be construed as waiver by County of any breach of covenants of Contract or waiver of any default of Contractor and making of any such payment by County while any such default or breach shall exist shall in no way impair or prejudice right of County with respect to recovery of damages or other remedy as result of such breach or default.
- B. Contractor shall remedy and make good all defective workmanship and materials and pay for any damage to other work resulting there from, which appear within period of one (1) year from date of substantial completion, providing such defects are not clearly due to abuse or misuse by County. Department will give notice of observed defects with reasonable promptness.
- C. Guarantee on work executed after certified date of substantial completion will begin on date when such work is inspected and approved by Architect / Engineer and Public Works Project Manager.
- D. Where guarantees or warranties are required in sections of Specifications for periods in excess of one (1) year, such longer terms shall apply; however, Contractor's Performance and Payment Bonds shall not apply to any guarantee or warranty period in excess of one (1) year.

40. CONFLICTING CONDITIONS

- A. Any provision in any of Construction Documents which may be in conflict or inconsistent with any Articles in these General Conditions of Contract or Supplementary Conditions shall be void to extent of such conflict or inconsistency.
- B. In case of ambiguity or conflict between Drawings and Specifications, Specifications shall govern.
- C. Printed dimensions shall be followed in preference to measurements by scale. Large-scale drawings take precedence over small-scale drawings. Dimensions on Drawings and details are subject to field measurements of adjacent work.

41. NOTICE AND SERVICE THEREOF

- A. Any notice to Contractor from Department relative to any part of this Contract shall be in writing and considered delivered and service thereof completed, when said notice is posted, by certified or registered mail, to Contractor at Contractor's last given address, or delivered in person to said Contractor, or Contractor's authorized representative on the Work.

42. PROTECTION OF LIVES AND HEALTH

- A. In order to protect lives and health of Contractor's employees under Contract, Contractor shall comply with all pertinent provisions of Wisconsin Administrative Code, Rules of Department of Commerce, relating to Safety and Health.
- B. Contractor alone shall be responsible for safety, efficiency and adequacy of Contractor's tools, equipment and methods, and for any damage that may result from their failure or their improper construction, maintenance or operation.

43. AFFIRMATIVE ACTION PROVISION AND MINORITY / WOMEN / DISADVANTAGED BUSINESS ENTERPRISES

- A. Affirmative Action Provisions.
 - 1. During term of their Contract, Contractor agrees not to discriminate on basis of race, religion, color, sex, handicap, age, sexual preference, marital status, physical appearance, or national origin against any person, whether recipient of services (actual or potential), employee, or applicant for employment. Such equal opportunity shall include but not be limited to following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation or level of service(s). Contractor agrees to post in conspicuous places, these affirmative action standards so as to be visible to all employees, service recipients and applicants for this paragraph. Listing of prohibited bases for discrimination shall not be construed to amend in any fashion state or federal law setting forth additional bases and exceptions shall be permitted only to extent allowable in state or federal law.
 - 2. Contractor is subject to this Article only if Contractor has twenty (20) or more employees and receives \$20,000.00 or more in annual aggregate contracts with County. Contractor shall file and Affirmative Action Plan with Dane County Contract Compliance Specialist in accord with Chapter 19 of Dane County Code of Ordinances. Such plan must be filed within fifteen (15) business days of effective date of this Contract and failure to do so by said date shall constitute ground for immediate termination of Contract by County. Contractor shall also, during term of this Contract, provide copies of all announcements

- of employment opportunities to County's Office of Equity & Inclusion, and shall report annually number of persons, by race, sex and handicap status, who apply for employment, and, similarly classified, number hired and number rejected.
3. Contact Dane County Contract Compliance Specialist at Dane County Office of Equity & Inclusion, 210 Martin Luther King, Jr. Blvd., Room 356, Madison, WI 53703, 608/266-4192.
 4. In all solicitations for employment placed on Contractor's behalf during term of this Contract, Contractor shall include statement to affect Contractor is "Equal Opportunity Employer". Contractor agrees to furnish all information and reports required by County's Contract Compliance Specialist as same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and provision of this Contract.
- B. Minority / Women / Disadvantaged / Emerging Small Business Enterprises.
1. Chapter 19.508 of Dane County Code of Ordinances is official policy of Dane County regarding utilization of, to fullest extent of, Minority Business Enterprises (MBEs), Women Business Enterprises (WBEs) Disadvantage Business Enterprises (DBEs) and Emerging Small Business Enterprises (ESBEs).
 2. Contractor may utilize MBEs / WBEs / DBEs / ESBEs as subcontractors or suppliers. List of subcontractors will be required of low bidder as stated in this Contract. List shall indicate which are MBEs / WBEs / DBEs / ESBEs and percentage of subcontract awarded, shown as percentage of total dollar amount of bid.

44. COMPLIANCE WITH FAIR LABOR STANDARDS

- A. During term of this Contract, Contractor shall report to County Contract Compliance Specialist, within ten (10) business days, any allegations to, or findings by National Labor Relations Board (NLRB) or Wisconsin Employment Relations Commission (WERC) that Contractor has violated statute or regulation regarding labor standards or relations. If investigation by Contract Compliance Specialist results in final determination that matter adversely affects Contractor's responsibilities under this Contract, and which recommends termination, suspension or cancellation of this Contract, County may take such action.
- B. Contractor may appeal any adverse finding by Contract Compliance Specialist as set forth in Dane County Ordinance 25.015(11)(c) through (e).
- C. Contractor shall post this statement in prominent place visible to employees: "As condition of receiving and maintaining contract with Dane County, this employer shall comply with federal, state and all other applicable laws prohibiting retaliation or union organizing."

45. USE AND OCCUPANCY PRIOR TO ACCEPTANCE

- A. Contractor agrees to use and occupancy of portion or unit of the Work before formal acceptance by Department, provided Department:
 1. Secures written consent of Contractor; except when in opinion of Public Works Project Manager, Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other Contract requirements.
 2. Secures endorsement from insurance carrier and consent of Surety permitting occupancy of building or use of the Work during remaining period of construction, or, secures consent of Surety.
 3. Assumes all costs and maintenance of heat, electricity and water.

4. Accepts all work completed within that portion or unit of the Work to be occupied, at time of occupancy.

46. CLAIMS

- A. No claim may be made until Department's Deputy Public Works Director has reviewed Architect / Engineer's decision as provided for in Article 35 of General Conditions of Contract. If any claim remains unresolved after such review by Department's Deputy Public Works Director, the claim may be filed under Wisconsin Statute 893.80. Work shall progress during period of any dispute or claim. Unless specifically agreed between parties, venue will be in Dane County, Wisconsin.

47. ANTITRUST AGREEMENT

- A. Contractor and County recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by County. Therefore, Contractor hereby assigns to County any and all claims for such overcharges as to goods and materials purchased in connection with this Contract, except as to overcharges which result from antitrust violations commencing after price is established under this Contract and any change order thereto.

48. INSURANCE

- A. Contractor Carried Insurance:
 1. Contractor shall not commence work under this Contract until Contractor has obtained all insurance required under this Article and has provided evidence of such insurance to Risk Manager, 425 City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703. Contractor shall not allow any subcontractor to commence work until insurance required of subcontractor has been so obtained and approved. Company providing insurance must be licensed to do business in Wisconsin.
 2. Worker's Compensation Insurance:
 - a) Contractor shall procure and shall maintain during life of this Contract, Worker's Compensation Insurance as required by statute for all of Contractor's employees engaged in work at site of project under this Contract and, in case of any such work sublet, Contractor shall require subcontractor similarly to provide Worker's Compensation Insurance for all of latter's employees to be engaged in such work unless such employees are covered by protection afforded by Contractor's Worker's Compensation Insurance.
 - b) If any claim of employees engaged in hazardous work on project under this Contract is not protected under Worker's Compensation Statute, Contractor shall provide and shall cause each subcontractor to provide adequate Employer's Liability Insurance for protection of such of Contractor's employees as are not otherwise protected.
 3. Contractor's Public Liability and Property Damage Insurance:
 - a) Contractor shall procure and maintain during life of this Contract, Contractor's Public Liability Insurance and Contractor's Property Damage Insurance in amount not less than \$1,000,000 bodily injury, including accidental death, to any one person, and subject to same limit for each person, in amount not less than \$1,000,000 on account of one accident, and Contractor's Property Damage Insurance in amount not less than \$1,000,000 or combined single limit of at least \$1,000,000 with excess coverage over and above general liability in amount not less than \$5,000,000. Contractor shall add "Dane County" as additional insured for each project.
 - b) Contractor's Public Liability and Property Damage Insurance shall include Products, Completed Operation, and Contractual Liability under Insurance Contract.

“Contractor shall in all instances save, defend, indemnify and hold harmless County and Architect / Engineer against all claims, demands, liabilities, damages or any other costs which may accrue in prosecution of the Work and that Contractor will save, defend, indemnify and hold harmless County and Architect / Engineer from all damages caused by or as result of Contractor’s operations” and each shall be listed as additional insured on Contractor’s and subcontractors’ insurance policies.

- c) Obligations of Contractor under Article 50.A.2.b) shall not extend to liability of Architect / Engineer, agents or employees thereof, arising out of:
 - 1) Preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications; or
 - 2) Giving of or failure to give directions or instructions by Architect / Engineer, agents or employees thereof provided such giving or failure to give is primary cause of injury or damage.
- d) Contractor shall procure and shall maintain during life of this Contract, Comprehensive Automobile Liability Insurance covering owned, non-owned and hired automobiles for limits of not less than \$1,000,000 each accident single limit, bodily injury and property damage combined with excess coverage over and above general liability in amount not less than \$5,000,000.
- e) Contractor shall either:
 - 1) Require each subcontractor to procure and to maintain during life of subcontract, subcontractor’s Public Liability Property Damage Insurance, and Comprehensive Automobile Liability Insurance of type and in same amount specified in preceding paragraphs; or
 - 2) Insure activities of subcontractors in Contractor’s own policy.
- 4. Scope of Insurance and Special Hazards: Insurance required under Article 50.A.2 & 50.A.3. hereof shall provide adequate protection for Contractor and subcontractors, respectively, against damage claims which may arise from operations under this Contract, whether such operation be by insured or by anyone directly or indirectly employed by insured and also against any of special hazards which may be encountered in performance of this Contract as enumerated in Supplementary Conditions.
- 5. Proof of Carriage of Insurance: Contractor shall furnish Risk Manager with certificates showing type, amount, class of operations covered, effective dates, dates of expiration of policies and “Dane County” listed as additional insured. Such certificates shall also contain (substantially) following statement: “Insurance covered by this certificate will not be canceled or materially altered, except after ten (10) business days written notice has been received by Risk Manager.”

B. Builder’s Risk:

- 1. County shall provide Builder’s Risk insurance coverage for its insurable interests in construction or renovation projects with completed value of \$1,000,000 or less. Therefore, if project completed value is more than \$1,000,000, Contractor shall obtain and maintain in force, at its own expense, Builder’s Risk Insurance on all risks for amount equal to full completed value of covered structure or replacement value of alterations or additions. Any deductible shall not exceed \$25,000 for each loss. Policy shall include occupancy clause and list Dane County as loss payee.

C. Indemnification / Hold Harmless:

- 1. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from and against all claims, damages, losses and expenses including attorneys’ fees arising out of or resulting from performance of the Work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, and is caused in whole or in part by any act or omission of Contractor, any subcontractor,

- anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by part indemnified hereunder.
2. In any and all claims against Dane County, its boards, commissions, agencies, officers, employees and representatives or by any employee of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, indemnification obligation under this Contract shall not be limited in any way by any limitation on amount or type of damages, compensation or benefits payable by or for Contractor or any subcontractor under worker's compensation acts, disability benefits or other employee benefit acts.
 3. Obligations of Contractor under this Contract shall not extend to liability of Architect / Engineer, its agents or employees arising out of:
 - a) Preparation or approval of maps, drawings, opinion, reports, surveys, change orders, designs or specifications; or
 - b) Giving of or failure to give directions or instruction by Architect / Engineer, its agents or employees provided such giving or failure to give is primary cause of injury or damage.
 4. Dane County shall not be liable to Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

49. WISCONSIN LAW CONTROLLING

- A. It is expressly understood and agreed to by parties hereto that in event of any disagreement or controversy between parties, Wisconsin law shall be controlling.


END OF SECTION

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

1. APPLICATION & CERTIFICATE FOR PAYMENT

- A. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit partial and final Application & Certificate for Payment for work under said contract. Form shall provide similar information as shown on AIA G702™ and G703™ forms (samples shown below). Forms shall be submitted to project Architect / Engineer for approval.



AIA Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	PROJECT:	APPLICATION NO:	Distribution to:
		PERIOD TO:	OWNER <input type="checkbox"/>
FROM CONTRACTOR:	VIA ARCHITECT:	CONTRACT FOR:	ARCHITECT <input type="checkbox"/>
		CONTRACT DATE:	CONTRACTOR <input type="checkbox"/>
		PROJECT NOS:	FIELD <input type="checkbox"/>
			OTHER <input type="checkbox"/>

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM \$ _____

2. NET CHANGE BY CHANGE ORDERS \$ _____

3. CONTRACT SUM TO DATE (Line 1 + 2) \$ _____

4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) \$ _____

5. RETAINAGE:

a. _____ % of Completed Work
(Columns D + E on G703) \$ _____

b. _____ % of Stored Material
(Column F on G703) \$ _____

Total Retainage (Lines 5a + 5b, or Total in Column I of G703) \$ _____

6. TOTAL EARNED LESS RETAINAGE \$ _____
(Line 4 minus Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT \$ _____
(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE \$ _____

9. BALANCE TO FINISH, INCLUDING RETAINAGE \$ _____
(Line 3 minus Line 6)

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$	\$
Total approved this month	\$	\$
TOTAL	\$	\$
NET CHANGES by Change Order	\$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before me this _____ day of _____

Notary Public:
My commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:


By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

Continuation Sheet

AIA Document G702™-1992, Application and Certificate for Payment, or G732™-2009, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached. In tabulations below, amounts are in US dollars. Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO.:

A ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		F MATERIALS PRESENTLY STORED <i>(Not in D or E)</i>	G TOTAL COMPLETED AND STORED TO DATE <i>(D+E+F)</i>	H BALANCE TO FINISH <i>(C-G)</i>	I RETAINAGE <i>(if variable rate)</i>
			D FROM PREVIOUS APPLICATION <i>(D + E)</i>	E THIS PERIOD				
								
GRAND TOTAL								

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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END OF SECTION

SECTION 00 73 00

BEST VALUE CONTRACTING

1. CONTRACTORS / LICENSURE APPLICANTS

The Dane County Department of Public Works requires contractors & subcontractors to be a Best Value Contractor (BVC) before being hired. Contractor & subcontractor application documents should be turned in immediately. Contractor approval or exemption must be complete prior to Bid Due Date / Time. All subcontractors must also be approved or prove their exemption ten (10) business or more days before performing any work under a County contract. This document shall be completed, properly executed, along with the necessary attachments and additional information that the County requires for the protection and welfare of the public in the performance of a County contract.

Contractors or subcontractors of any tier who attain qualification status will retain that status for a period of three (3) years from the date of qualification. Contractors shall notify the Dane County Department of Public Works, Highway & Transportation within fifteen (15) days of any changes to its business or operations that are relevant to the application or status. Failure to do so could result in suspension, revocation of the contractor’s qualification, debarment from County contracts for up to three (3) years and / or other sanctions available under the law.

No contracts will be awarded for construction work performed on Dane County projects unless the contractor is currently approved as a Wisconsin Trade Trainer or has applied for approval as an Apprenticeship Trade Trainer to the Wisconsin Department of Workforce Development and agrees to an acceptable apprenticeship program. If you are not currently approved as a Wisconsin Trade Trainer, or have not applied for approval as an Apprenticeship Trade Trainer, please contact the Department of Workforce Development - Bureau of Apprenticeship Standards at 608/266-3133 or visit their web site at: <https://dwd.wisconsin.gov/apprenticeship/>.

Fill out the BVC Application at the Public Works Engineering Division web site (publicworks.countyofdane.com/bvc). This document is only provided in the RFB for reference. The following page shows what the questions are on the application.

2. EXEMPTIONS TO QUALIFICATION

Contractors performing work that does not apply to an apprenticeable trade, as outlined in Item 4. Apprenticeable Trades, is the only reason for claiming an exemption if not an active Wisconsin Trades Trainer. See Question 18A.

3. APPLICATION QUESTIONS

NO.	PROOF OF RESPONSIBILITY	CHECK IF APPLICABLE
1	Does your firm acknowledge that in doing work under any County Public Works Contract, it will be required to use as subcontractors only those contractors that are also qualified with the County or become so ten (10) or more days before beginning any work?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
2	Does your firm possess all technical qualifications and resources, including equipment, personnel and financial resources, necessary to perform the work required for any project or obtain the same through the use of responsible, qualified subcontractors?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
3	Will your firm possess all valid, effective licenses, registrations or certificates required by federal, state, county, or local law, which are necessary for the type of work to be performed including, but not limited to, those for any type of trade work or specialty work?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>

4	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
5	Will your firm meet all insurance requirements as required by applicable law or specifications, including general liability insurance, workers compensation insurance and unemployment insurance requirements?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
6	Will your firm maintain a substance abuse policy for employees hired for public works contracts that comply with Wis. Stats. Sec. 103.503?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
7	Will your employees who will perform work on a Public Works project all be covered under a current workers compensation policy and be properly classified under such policy?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
8	Will your employees who will perform work on a Public Works project have the opportunity to enroll in minimum essential coverage and not be subject to an enrollment period of more than 60 days per the federal Affordable Care Act, Sec. 1513?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
9	Will your firm fully abide by the equal opportunity and affirmative action requirements of all applicable laws, including County ordinances?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>
10	Has your firm been the subject of any order or judgement from any State or Federal Agency or court concerning employment practice, including but not limited to: classification of employees under state unemployment or workers compensation laws; minimum wage, overtime pay, recordkeeping, and child labor standards imposed by federal or state law; and employment discrimination or unfair labor practices prohibited by federal or state law. (Attach copies of any order or judgement)	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
11	Is your firm authorized or registered to transact business in the state by the Department of Financial Institutions in compliance with Wis. Stat. Chaps. 178, 179, 180, 181, or 183?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
12	In the past three (3) years, has your firm had control or has another corporation, partnership or other business entity operating in the construction industry controlled it? If so, please attach a statement explaining the nature of the firm relationship?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
13	In the past three (3) years, has your firm had any type of business, contracting or trade license, certification or registration revoked or suspended?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
14	In the past three (3) years, has your firm been debarred by any federal, state or local government agency?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
15	In the past three (3) years, has your firm defaulted or failed to complete any contract?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
16	In the past three (3) years, has your firm committed a willful violation of federal, state or local government safety laws as determined by a final decision of a court or government agency authority.	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
17	In the past three (3) years, has your firm been in violation of any law relating to your contracting business where the penalty for such violation resulted in the imposition of a penalty greater than \$10,000?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.
18	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: <input type="checkbox"/>	No: <input type="checkbox"/> If Yes, attach details.

18A	Is your firm claiming an exemption to qualification?	Yes: <input type="checkbox"/> No: <input type="checkbox"/> If Yes, attach details.
19	Contractor has been in business less than one year?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>

4. APPRENTICEABLE TRADES:

- Bricklayer
- Boilermaker
- Carpenter
- Cement Mason (Concrete Finisher)
- Cement Mason (Heavy Highway)
- Construction Craft Laborer
- Data Communications Installer
- Electrician
- Elevator Mechanic / Technician
- Environmental Systems Technician / HVAC Service Technician / HVAC Install & Service
- Glazier
- Heavy Equipment Operator / Operating Engineer
- Insulation Worker (Heat & Frost)
- Iron Worker (Assembler, Metal Buildings)
- Painter / Decorator
- Plasterer
- Plumber
- Roofer / Waterproofer
- Sheet Metal Worker
- Sprinkler Fitter
- Steamfitter (Service & Refrigeration)
- Taper & Finisher
- Telecommunications (Voice, Data & Video) Installer / Technician
- Tile Setter

END OF SECTION

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SECTION 00 73 11

FAIR LABOR PRACTICES CERTIFICATION

The undersigned, for and on behalf of the BIDDER, APPLICANT or PROPOSER named herein, certifies as follows:

- A. That he or she is an officer or duly authorized agent of the above-referenced BIDDER, APPLICANT or PROPOSER, which has a submitted a bid, application or proposal for a contract or agreement with the county of Dane.
- B. That BIDDER, APPLICANT or PROPOSER has (check one):

_____ not been found by the National Labor Relations Board (“NLRB”) or the Wisconsin Employment Relations Commission (“WERC”) to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

_____ been found by the National Labor Relations Board (“NLRB”) or the Wisconsin Employment Relations Commission (“WERC”) to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

Officer or Authorized Agent Signature

Date

Printed or Typed Name and Title

Printed or Typed Business Name

NOTE: You can find information regarding the violations described above at: www.nlr.gov and werc.wi.gov.

For reference, Dane County Ordinance 25.09 is as follows:

- (1) BIDDER RESPONSIBILITY. (a) Any bid, application or proposal for any contract with the county, including public works contracts regulated under chapter 40, shall include a certification indicating whether the bidder has been found by the National Labor Relations Board (NLRB) or the Wisconsin Employment Relations Committee (WERC) to have violated any statute or regulation regarding labor standards or relations within the last seven years. The Controller shall investigate any such finding and make a recommendation to the committee, which shall determine whether the conduct resulting in the finding affects the bidder’s responsibility to perform the contract.

If you indicated that the NLRB or WERC have found you to have such a violation, you must include copies of any relevant information regarding such violation with your proposal, bid or application.

Include this completed Certification with your bid, application or proposal.

END OF SECTION

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SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Summary
 2. Summary of the Work
 3. Contractor Use of Premises
 4. Applications for Payment
 5. Change Procedures
 6. Alternates
 7. Coordination
 8. Cutting and Patching
 9. Conferences
 10. Progress Meetings
 11. Job Site Administration
 12. Submittal Procedures
 13. Proposed Products List
 14. Shop Drawings
 15. Product Data
 16. Samples
 17. Manufacturers' Instructions
 18. Manufacturers' Certificates
 19. Quality Assurance / Quality Control of Installation
 20. References
 21. Interior Enclosures
 22. Protection of Installed Work
 23. Parking
 24. Staging Areas
 25. Occupancy During Construction and Conduct of Work
 26. Protection
 27. Progress Cleaning
 28. Products
 29. Transportation, Handling, Storage and Protection
 30. Product Options
 31. Substitutions
 32. Starting Systems
 33. Demonstration and Instructions
 34. Contract Closeout Procedures
 35. Final Cleaning
 36. Adjusting
 37. Operation and Maintenance Data
 38. Spare Parts and Maintenance Materials
 39. As-Built and Record Drawings and Specifications

1.2 SUMMARY OF THE WORK

- A. Project Description: Perform the Work as specified and detailed in Construction Documents package. Contractor to provide all necessary services to remodel the Child Support Agency in Suite 365 of the City-County Building.
- B. Work by Owner:
 - 1. Move out & move in County staff from / to construction area.
 - 2. Test & removal of any asbestos containing materials that may be discovered at the site.
 - 3. Furnish & install furniture, fixtures & equipment (FF&E).
 - 4. Furnish & install project signage.
- C. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy. Provide Public Works Project Manager with copies of all permits.

1.3 CONTRACTOR USE OF PREMISES

- A. Limit use of premises to allow work by others and work by Owner.
- B. Coordinate utility outages and shutdowns with Owner.
- C. Contractors or Subcontractors shall not visit the site if they are or have recently been ill.

1.4 APPLICATIONS FOR PAYMENT

- A. Submit each Application for Payment on AIA G702™ and G703™ forms or approved contractors invoice form. Contractor shall have these forms notarized and signed.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment Period: Monthly.
- D. Submit Applications for Payment to Architect / Engineer electronically for initial approval. Architect / Engineer will forward approved copies to Owner who will also approve & process for payment.

1.5 CHANGE PROCEDURES

- A. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from contingency allowance.

1.6 ALTERNATES

- A. Alternates quoted on Bid Form shall be reviewed and accepted or rejected at Owner's option.
- B. Coordinate related work and modify surrounding work as required.
- C. Schedule of Alternates: N/A.

1.7 COORDINATION

- A. Coordinate scheduling, submittals, and work of various sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.
- C. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings.
- D. Refer to Drawings for recommended work sequence and duration.
- E. Contractor shall provide Public Works Project Manager with work plan that ensures the Work will be completed within required time of completion.
- F. Construct work in stages to accommodate Dane County operations. All activities shall be coordinated 48 hours (minimum) in advance with Public Works Project Manager unless noted otherwise in these specifications.
- G. Public Works Project Manager may choose to photograph or videotape site or workers as the Work progresses.

1.8 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching new work; restore work with new Products.
- B. Submit written request in advance of cutting or altering structural or building enclosure elements.
- C. Fit work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- D. Refinish surfaces to match adjacent finishes.

1.9 CONFERENCES

- A. Project shall have pre-bid conference; see Instructions to Bidders.

- B. Owner will schedule preconstruction conference after Award of Contract for all affected parties.
- C. Contractor shall submit Construction Schedule at pre-construction meeting.
- D. When required in individual Specification section, convene pre-installation conference at project site prior to commencing work of Section.

1.10 PROGRESS MEETINGS

- A. Day & time of progress meetings to be determined at pre-construction meeting.
- B. Schedule and administer meetings throughout progress of the Work at minimum of one (1) per week with Public Works Project Manager, involved Dane County staff & other individuals as required.
- C. Preside at meetings, record minutes, and distribute copies within two (2) business days to those affected by decisions made.
- D. Attendance at progress meetings by General Contractor, subcontractors, or their authorized representative, is mandatory.
- E. Contractors shall give verbal reports of progress on the Work, discuss schedule for upcoming period and present all conflicts, discrepancies or other difficulties for resolution.

1.11 JOB SITE ADMINISTRATION

- A. Contractor shall have project superintendent on site minimum of four (4) hours per week during progress of the Work.
- B. Contractor shall not change their project superintendent or project manager for duration of the Work without written permission of Public Works Project Manager.
- C. Architect / Engineer shall have representative on site once per week on average during progress of the Work.

1.12 SUBMITTAL PROCEDURES

- A. Submittal form to identify Project, Contractor, Subcontractor or supplier; and pertinent Construction Documents references.
- B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with requirements of the Work and Construction Documents.
- C. Identify variations from Construction Documents and Product or system limitations that may be detrimental to successful performance of completing the Work.

- D. Revise and resubmit submittals as required; identify all changes made since previous submittal.
- 1.13 PROPOSED PRODUCTS LIST
- A. Within fifteen (15) business days after date of Award of Contract, submit complete list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.
- 1.14 SHOP DRAWINGS
- A. Submit number of copies that Contractor requires, plus one (1) copy that shall be retained by Public Works Project Manager.
- 1.15 PRODUCT DATA
- A. Submit number of copies that Contractor requires, plus two (2) copies that shall be retained by Public Works Project Manager.
 - B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.
- 1.16 SAMPLES
- A. Submit samples to illustrate functional and aesthetic characteristics of Product.
 - B. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns for Public Works Project Manager's selection.
- 1.17 MANUFACTURERS' INSTRUCTIONS
- A. When specified in individual Specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- 1.18 MANUFACTURERS' CERTIFICATES
- A. When specified in individual Specification sections, submit manufacturers' certificate to Public Works Project Manager for review, in quantities specified for Product Data.
 - B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- 1.19 QUALITY ASSURANCE / QUALITY CONTROL OF INSTALLATION
- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce work of specified quality.
 - B. Comply fully with manufacturers' instructions.

- C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.20 REFERENCES

- A. Conform to reference standard by date of issue current as of date for receiving bids.
- B. Should specified reference standard conflict with Construction Documents, request clarification from Public Works Project Manager before proceeding.

1.21 INTERIOR ENCLOSURES

- A. Provide temporary partitions as required to separate work areas from Owner occupied areas, to prevent distribution of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

1.22 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual Specification sections.

1.23 PARKING

- A. Arrange for temporary parking areas to accommodate construction personnel. One & only one parking stall for General Contractor shall be available at the Work site.
- B. All contractors and their employees shall cooperate with General Contractor and others in parking of vehicles to avoid interference with normal operations and construction activities.
- C. Do not obstruct existing service drives and parking lots with equipment, materials and / or vehicles. Keep accessible for Owner's use at all times.

1.24 STAGING AREAS

- A. Coordinate staging areas with Public Works Project Manager prior to starting the Work.
- B. On-site space for use as staging areas and storage of materials is limited and will be apportioned among various Contractors as their needs dictate with due regard for storage requirements of each Contractor. Each Contractor shall be responsible for safety of equipment and materials that are stored on site.

1.25 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

- A. All construction material and salvage material shall be removed from facility or secured at day's end.
- B. Contractors are asked to not work at facility if they are ill with something contagious.

- C. All contractors are expected to leave work areas in conditions; such that area can be occupied immediately upon leaving area.
- D. Smoking is prohibited on Dane County property.
- E. Owner reserves right at any time to dismiss from premises any Contractor or construction personnel that do not uphold requirements of this Section.
- F. Owner shall not be held liable for any lost time, wages, or impacts to construction schedule by any Contractor or construction personnel dismissed for failure to uphold requirements of this Section.
- G. Areas of existing facility will be occupied during period when the Work is in progress. Work may be done during normal business hours (8:00 am to 4:30 pm), but confer with Owner, schedule work and store materials so as to interfere as little as possible with normal use of premises. Work performed on Saturday shall be by permission of Owner. Notify Owner when coring or similar noise making work is to be done and obtain Owner's written approval of schedule. If schedule is not convenient for Owner, reschedule and resubmit new times for Owner approval. Coring of floor along with other noisy work may have to be done on second and third shifts.
- H. Work shall be done and temporary facilities furnished so as not to interfere with access to any occupied area and so as to cause least possible interference with normal operation of facility or any essential service thereof.
- I. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.
- J. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this Contract is to be performed.
- K. Each Contractor shall arrange with Owner to make necessary alterations, do new work, make connections to all utilities, etc., and at such times as will not cause interruption of utility services to facility. Contractor doing this work shall protect, cap, cut off and / or replace and relocate existing pipes, electrical work and other active utilities encountered which may interfere with new construction work.
- L. New work in extension of existing work shall correspond in all respects with that to which it connects or similar existing work unless otherwise indicated or specified.
 - 1. Existing work shall be cut, altered, removed or replaced as necessary for performance of Contract obligations.
 - 2. Work remaining in place, damaged or defaced by reason of work done under this Contract shall be restored equal to its condition at time of Award of Contract.
 - 3. If removal of work exposes discolored or unfinished surfaces or work out of alignment, such surfaces shall be refinished or materials replaced as necessary to make continuous work uniform and harmonious.
- M. Contractor is not responsible for providing & maintaining temporary toilet facilities.

1.26 PROTECTION

- A. Contractor shall protect from damage / injury all trees, shrubs, hedges, plantings, grass, mechanical, electrical & plumbing equipment, walks and driveways and pay for any damage to same resulting from insufficient or improper protection.
- B. Contractor shall provide and maintain barricades & signage to prohibit public access to construction site.

1.27 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

1.28 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by Construction Documents.

1.29 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

- A. Transport, handle, store and protect Products in accordance with manufacturer's instructions.

1.30 PRODUCT OPTIONS

- A. Where definite material is specified, it is not intentional to discriminate against "equal" product made by another manufacturer. Intention is to set definite standard of material quality. Should bidder choose to bid materials other than those specified, bidder shall submit said materials specifications to Public Works Project Manager for approval at least seven (7) business days prior to Bid Due Date.
- B. Products and materials that are not specified, but have been approved for use by Public Works Project Manager shall be identified in addenda to all bidding contractors.
- C. Requests for material or product substitutions submitted after Bid Due Date may be considered. Owner reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.31 SUBSTITUTIONS

- A. Public Works Project Manager shall consider requests for Substitutions only up to seven (7) business days prior to date of Bid Due Date.

- B. Document each request with complete data substantiating compliance of proposed Substitution with Construction Documents.
- C. Submit three (3) copies of requests for Substitution for consideration. Limit each request to one (1) proposed Substitution.
- D. Substitutions shall not change contract price established at Bid Due Date.

1.32 STARTING SYSTEMS

- A. Provide written notification prior to start-up of each equipment item or system.
- B. Ensure that each piece of equipment or system is ready for operation.
- C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.
- D. Submit written report that equipment or system has been properly installed and is functioning correctly.

1.33 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of final inspection.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.
- C. Owner may choose to photograph or videotape demonstration session; demonstration and demonstrator shall be to level of satisfaction of Owner.

1.34 CONTRACT CLOSEOUT PROCEDURES

- A. Submit written certification that Construction Documents have been reviewed, the Work has been inspected, and the Work is complete in accordance with Construction Documents and ready for Public Works Project Manager's inspection.
- B. Submit final Application for Payment identifying total adjusted Contract Sum / Price, previous payments, and amount remaining due.

1.35 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view.
- C. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.36 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.37 OPERATION AND MAINTENANCE MANUAL

- A. Provide two (2) bound, hard-copy operation and maintenance manuals that include all systems, materials, products, equipment, mechanical and electrical equipment and systems supplied and installed in the Work. Provide electronic version of operation and maintenance manual also.

1.38 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide Products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.
- B. Deliver to the Work site and place in location as directed.

1.39 AS-BUILT AND RECORD DRAWINGS AND SPECIFICATIONS

- A. Contractor-produced Drawings and Specifications shall remain property of Contractor whether Project for which they are made is executed or not. Contractor shall furnish Architect / Engineer with original marked up redlines of Construction Documents' drawings and specifications that shall include all Addendums, Change Orders, Construction Bulletins, on-site changes, field corrections, etc. These are project As-Built Drawings & Specifications.
- B. Architect / Engineer shall update original Construction Documents to include all Addendums & any other changes including those provided by Contractor in As-Built Drawings & Specifications. These updates are project Record Drawings & Specifications.
- C. Architect / Engineer shall furnish Public Works Project Manager with Record Drawings as detailed in Professional Services Agreement.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT, DISPOSAL & RECYCLING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Summary
 - 2. Waste Management Goals
 - 3. Construction and / or Demolition Waste Management
 - 4. Waste Management Plan
 - 5. Reuse
 - 6. Recycling
 - 7. Materials Sorting and Storage On Site
 - 8. Lists of Recycling Facilities Processors and Haulers
 - 9. Waste Management Plan Form
- B. Related Sections:
 - 1. Section 01 00 00 - General Requirements

1.2 WASTE MANAGEMENT GOALS

- A. Dane County requires that as many waste materials as possible produced as result of this project be salvaged, reused or recycled in order to minimize impact of construction waste on landfills and to minimize expenditure of energy and cost in fabricating new materials. Additional information may be found in Dane County Green Building Policy, Resolution 299, 1999-2000.

1.3 CONSTRUCTION AND / OR DEMOLITION WASTE MANAGEMENT

- A. All construction and demolition waste suitable for recycling must go to Dane County Construction & Demolition Recycling Facility located at 7102 US Hwy 12, Madison, located across from Yahara Hills Golf Course. This facility can receive mixed loads of construction and demolition waste. For complete list of acceptable materials see www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.
- B. Dane County Landfill, also at 7102 US Hwy 12, Madison, must receive all other waste from this project. www.countyofdane.com/pwht/recycle/landfill.aspx.

1.4 WASTE MANAGEMENT PLAN

- A. Contractor shall develop Waste Management Plan (WMP) for this project. Dane County's Special Projects & Materials Manager may be contacted with questions. Outlined in RECYCLING section of this specification are examples of materials that can be recycled or reused as well as recommendations for waste sorting methods.
- B. Contractor shall complete WMP and include cost of recycling / reuse in Bid. WMP will be submitted to Public Works Project Manager within fifteen (15)

business days of Bid Due date. Copy of blank WMP form is in this Section. Submittal shall include cover letter and WMP form with:

1. Information on:
 - a. Types of waste materials produced as result of work performed on site;
 - b. Estimated quantities of waste produced;
 - c. Identification of materials with potential to be recycled or reused;
 - d. How materials will be recycled or reused;
 - e. On-site storage and separation requirements (on site containers);
 - f. Transportation methods; and
 - g. Destinations.

1.5 REUSE

- A. Contractors and subcontractors are encouraged to reuse as many waste materials as possible. Salvage should be investigated for materials not reusable on site.

1.6 RECYCLING

- A. These materials must be recycled at Dane County Construction & Demolition Recycling Facility:
 1. Wood.
 2. Wood Pallets.
 3. PVC Plastic (pipe, siding, etc.).
 4. Cardboard.
 5. Metal.
 6. Unpainted Gypsum Drywall.
- B. These materials can be recycled elsewhere in Dane County area:
 1. Fluorescent Lamps.
 2. Foam Insulation & Packaging (extruded and expanded).
 3. Carpet Padding.
- C. All materials must be recycled at WDNR permitted waste processing facilities that adhere to all State Statutes.

1.7 MATERIALS SORTING AND STORAGE ON SITE

- A. Contractor shall provide separate containers for recyclable materials. Number of containers will be dependent upon project and site conditions.
- B. Contractor shall provide on-site locations for subcontractors supplied recycling containers to help facilitate recycling.
- C. Mixed loads of recycled materials are allowed only per instructions at www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.

1.8 LISTS OF RECYCLING FACILITIES PROCESSORS AND HAULERS

- A. Refer to www.countyofdane.com/pwht/recycle/CD_Recycle.aspx for information on Dane County Construction & Demolition Recycling Facility.

- B. Web site www.countyofdane.com/pwht/recycle/categories.aspx lists current information for Dane County Recycling Markets. Contractors can also contact Allison Rathsack at 608/266-4990, or local city, village, town recycling staff listed at site www.countyofdane.com/pwht/recycle/contacts.aspx. Statewide listings of recycling / reuse markets are available from UW Extension at <https://www.uwgb.edu/shwec/>.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

WASTE MANAGEMENT PLAN FORM



Contractor Name: _____

Address: _____

Phone No.: _____ Recycling Coordinator: _____

MATERIAL	ESTIMATED QUANTITY	DISPOSAL METHOD (CHECK ONE)	RECYCLING / REUSE COMPANY OR DISPOSAL SITE
Salvaged & reused building materials	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Wood	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Wood Pallets	_____ units	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
PVC Plastic	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Cardboard	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Metals	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Unpainted Gypsum / Drywall	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Shingles	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Fluorescent Lamps	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Foam Insulation	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Carpet Padding	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Barrels & Drums	_____ units	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Other	_____	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Other	_____	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Other	_____	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

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

1.03 RELATED WORK

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

1.04 SUBMITTALS

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

1.05 DEFINITIONS

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

1.06 QUALITY ASSURANCE

- A. Comply with governing codes and regulations.

1.07 RECORD DRAWINGS

- 1
2 A. Maintain record drawings showing actual locations of utilities and other features encountered, and any
3 deviations from the original design. Show actual limits of removal and demolition.
4
- 5 1.08 SAFETY
6
- 7 A. Verify that all gas and electrical utilities have been abandoned or disconnected and associated hazards
8 mitigated, prior to beginning any demolition.
9
- 10 B. Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other explosive
11 or toxic fluids or gases. Purge lines and contain materials in accordance with all applicable regulations.
12 Store such piping outdoors until fumes are removed.
13
- 14 C. Maintain a clean and orderly site. Remove debris at end of each workday.
15
- 16 D. If hazardous materials are not anticipated, but encountered, terminate operations and contact the Owner
17 immediately. Follow all applicable local, state and federal regulations pertaining to hazardous materials.
18
- 19 1.09 PERMITS
20
- 21 A. Unless otherwise noted, Contractor shall be responsible for obtaining and paying for all permits necessary
22 to complete demolition work.
23
- 24 B. If necessary, file and maintain Notification of Demolition and/or Renovation and Application for Permit
25 Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter
26 NR447.
27
- 28 1.10 DISCONNECTION OF SERVICES
29
- 30 A. Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all
31 existing utilities, communication systems, alarm systems and other services.
32
- 33 B. Disconnect all services in manner which insures continued operation in facilities not scheduled for
34 demolition.
35
- 36 C. Disconnect all services in manner which allows for future connection to that service.
37
- 38 D. Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.
39
- 40 1.11 REMOVAL/SALVAGING OF ITEMS
41
- 42 A. Carefully remove all items that are scheduled to be salvaged.
43
- 44 B. Secure salvaged items to allow for future movement; provide pallets, skids and other devices as
45 necessary. Secure all loose parts.
46
- 47 C. Provide crates, padding, tarps and other measures necessary to protect salvaged items during storage.
48 Store items in secure location, safe from vandalism, weather, dust and other adverse elements.
49
- 50 D. Where salvaged items are indicated to be turned over to Owner, deliver to location on property where
51 designated by Owner.
52

1 E. Where indicated to be incorporated into new work, store the salvaged item in secure location until trade
2 responsible for re-installation mobilizes his equipment and storage facilities to the site, or otherwise
3 accepts responsibility for the salvaged item.
4

5 F. Items of salvage value that are not to be returned to the Owner or the A/E shall be removed from the
6 structure. Storage or sale of such salvage items at project site is prohibited.
7

8 PART 2 - PRODUCTS

9

10 2.01 EQUIPMENT

11

12 A. Use Contractor's normal equipment for demolition purposes and which meets all safety requirements
13 imposed on such equipment.
14

15 PART 3 - EXECUTION

16

17 3.01 GENERAL

18

19 A. Examine all areas of work, verify all existing conditions, and report any unsatisfactory conditions.
20

21 3.02 PROTECTION OF EXISTING WORK AND FACILITIES

22

23 A. Verify the locations of, and protect, any building elements, utilities, and all other such facilities that are
24 intended to remain or be salvaged.
25

26 B. Make such explorations and probes as necessary to ascertain any required protection measures that shall
27 be used before proceeding with demolition.
28

29 C. Take all measures necessary to safeguard all existing work and facilities which are outside the limits of
30 the work.
31

32 D. Furnish and install temporary enclosures or other barriers as shown on the plans or as otherwise necessary
33 to protect existing features.
34

35 E. Protect adjacent interior areas from collection of dust and noxious fumes. Seal HVAC system ductwork
36 and grilles to prevent contamination of building or mechanical systems.
37

38 F. Provide protection for workers, public, adjacent construction and occupants of existing building(s).
39

40 G. Report damage of any facilities or items scheduled for salvaging to the Owner.
41

42 H. Repair or replace any damaged facilities that are not scheduled for demolition.
43

44 I. Do not damage building elements and improvements indicated to remain.
45

46 J. Do not close or obstruct walks, drives, other occupied or used spaces, or facilities without the written
47 permission from the A/E and the authorities having jurisdiction.
48

49 K. Do not interrupt utilities serving occupied facilities without permission from the A/E and authorities
50 having jurisdiction. If necessary, provide temporary utilities.
51

52 L. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective
53 measures until operations can be continued properly.

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- M. If necessary, provide additional materials to protect existing building components that are to remain.
- N. Where necessary to prevent collapse of any construction, install temporary shores, struts or bracing. Do not commence demolition work until all temporary construction is complete.
- O. Take precautions to guard against movement, settlement or collapse of any surrounding construction designated to remain and be liable for any such movement, settlement or collapse.

3.03 DEMOLITION

- A. Remove all equipment, fixtures and other materials scheduled for salvage prior to beginning demolition operations.
- B. Abandon gas, electric and communication utilities in accordance with local utility company requirements, or applicable substantive requirements if considered private.
- C. Remove all sealant, fasteners and damaged or rotten blocking from existing construction to remain where demolition occurs.

3.04 RECYCLING

- A. Transport and dispose all demolition waste in accordance with local, state, and federal guidelines and Section 01 74 19 Construction Waste Management, Disposal & Recycling.

3.05 SCHEDULE

- A. Items to be removed shall be as indicated on the Drawings.
 - 1. Items to be stored and reinstalled.
 - 2. Items to be removed from site by Contractor.
- B. Items to remain (if clarification required).

3.06 CLEANING

- A. All adjacent areas shall be broom cleaned and ready to receive new construction.
- B. Remove from the site all debris resulting from the Work of this Section.

END OF SECTION 02 41 19

SECTION 04 40 00

STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Marble window stool replacement

1.03 RELATED WORK

- A. Selective Structure Demolition, Section 02 41 19

1.04 QUALITY ASSURANCE

- A. Manufacturer / installer / quarry shall have a minimum of five years production experience in work of quality and scope required on this project.
- B. Each color, grade, finish, type, and variety of stone shall be from a single quarry with sufficient resources to furnish materials of consistent quality, appearance, and physical properties.
- C. All units and placement thereof shall be in accord with Marble Institute of America and Building Stone Institute standards.

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract.
- B. Shop Drawings:
 - 1. Shop drawings shall be complete and shall include a layout plan, fabrication details, connection and anchorage details, location of lifting devices, and member identification marks. The identification marks shall appear on the manufactured units to facilitate correct field placement. Manufacturer's standard hardware will be clearly described.
- C. Samples:
 - 1. Submit two 12 inch x 12 inch samples representative of finished units to match existing gray color, linear pattern and texture.
 - 2. Submit samples of all fasteners, anchors, and adhesives being used in the installation of the marble and salvaged stone with a full description of their uses.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport and handle with proper equipment to protect units from dirt and damage. Place non-staining resilient spacers of even thickness between each unit. Units shall be palletized.
- B. Store to protect units from contact with soil or ground. Store units on firm surfaces to avoid warping and cracking. Place stored units so that the identification marks are visible.

PART 2 - PRODUCTS

1 2.01 MARBLE

- 2
3 A. Tennessee Marble or approved equal similar to existing gray color, linear texture.
4 a. Capitol Stone, contact: Jamie Laufenberg, 608.210.3180, or approved equal.
5
6 B. Free of cracks/seams/starts which may impair its structural integrity or function.
7
8 C. Polished finish on face and all exposed edges to match existing, book match adjacent panels.
9

10 2.03 ANCHORS

- 11
12 A. AISI Type 304/316 Stainless Steel. Provide strap anchors, dowels, clips, and bolt/nut anchors as
13 required by various conditions.
14

15 2.04 SEALANTS

- 16
17 A. Sealant for Locations Except as Specified in the Subsequent Paragraphs: Pecora Dynatroll,
18 Sonolastic NP-1, Tremco Dymonic, or equal one part urethane.
19 1. Equal means both quality and color options.
20
21 B. Primer, when required, as recommended by the Sealant Manufacturer.
22
23 C. Backer Rod, closed cell: "Green – Rod", Nomanco "HBR" or "Sonofoam".
24

25 PART 3 – EXECUTION

26
27 3.01 EXAMINATION

- 28
29 A. Each unit: Checked at fabrication site just prior to loading for transportation to the project site.
30 Accept no broken, cracked, spalled, warped, or otherwise defective units.
31

32 3.02 PREPARATION

- 33
34 A. Coordinate delivery, erection, of units.
35
36 B. Protect the work and material of other trades during installation of units.
37

38 3.03 INSTALLATION

- 39
40 A. Transportation, Site Handling, Erection: Performed with acceptable equipment methods, by
41 qualified personnel acceptable to manufacturer.
42
43 B. Place and align the member in final position in the structure on the final bearing surfaces. All
44 panels dry installed using anchors.
45
46 C. Natural stones conventionally anchored to back-up structure or to masonry.
47 1. Anchoring devices are installed to resist lateral and gravity loads.
48 2. Anchoring components shall be designed as simply as possible, with the fewest
49 components and types to be adjustable, and with careful prevention of galvanic and
50 chemical corrosion meeting Building Stone Institute guidelines.
51
52

53
END OF SECTION 04 40 00

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Blocking.

1.03 RELATED WORK

- A. Finish Carpentry: Section 06 20 00.
- B. Plastic Laminate Casework: Section 06 41 16.

1.04 QUALITY ASSURANCE

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. Lumber: WPA - Western Wood Products Association.
 - 2. Plywood: American Plywood Association "Plywood Commercial/Industrial Construction Guide".

1.05 DELIVERY, STORAGE AND HANDLING

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Store materials a minimum of 6-inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned material in wet or damp portions of building.
- D. While unloading, protect sheet materials from corners breaking and damaging surfaces.

1.06 PROJECT CONDITIONS

- A. Examine the substrates and supporting structures and the conditions under which the carpentry work is to be installed. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Coordinate location of nailers, blocking, and similar supports to allow proper attachment of work. Also coordinate with Owner Furnished Owner Installed items.

PART 2 - PRODUCTS

2.01 ROUGH HARDWARE

- A. Nails, spikes, screws, bolts, and similar items of size and types to rigidly secure members in place or as otherwise indicated.

1 2.02 LUMBER

- 2
3 A. Framing, Blocking: Douglas Fir-Larch, Southern Pine No. 2 or better, S4S, moisture content not to exceed
4 19%.
5 1. Horizontal Framing: Construction grade.
6 2. End jointed lumber not allowed.
7

8 2.03 PLYWOOD

- 9
10 A. Plywood wall sheathing shall be 3/4 inch thick, 5-ply, CDX APA Rated, unsanded with a minimum 16/0 span
11 rating.
12
13 B. Or as noted on plan.
14

15 2.04 FASTENERS

- 16
17 A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article
18 for material and manufacture.
19 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity,
20 provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
21
22 B. Nails, Brads, and Staples: ASTM F 1667.
23
24 C. Power-Driven Fasteners: CABO NER-272.
25
26 D. Wood Screws: ASME B18.6.1.
27
28 E. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated,
29 flat washers.
30
31 F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain,
32 without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal
33 to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted
34 by a qualified independent testing and inspecting agency.
35 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
36 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy
37 Group 1 or 2.
38

39 PART 3 - EXECUTION

40
41 3.01 GENERAL

- 42
43 A. Discard units of material with defects which might impair quality of work, and units which are too small to
44 fabricate the work with minimum joints or the optimum joint arrangement.
45
46 B. Set carpentry work to required levels and lines, with members plumb and true and accurately cut and fitted.
47
48 C. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by
49 recognized standards. Countersink nail heads on exposed carpentry work and fill holes. Use common wire
50 nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not
51 penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight
52 connections between members. Install fasteners without splitting of wood; pre-drill as required.
53

1 3.02 WOOD BLOCKING, AND NAILER INSTALLATION

2
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10

- A. Install where indicated and where required for 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. Build anchor bolts into masonry during installation of masonry work.

END OF SECTION 06 10 00

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SECTION 06 20 00

FINISH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

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

1.03 RELATED WORK

- A. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Rough Carpentry: Section 06 10 00.
 - 2. Joint Sealants: Section 07 92 00.
 - 3. Painting: Section 09 90 00.

1.04 SUBMITTALS

- A. General: Submit each item in this article according to General Conditions of Contract.
 - 1. Shop drawings for all millwork; receive approval prior to fabrication; draw in related or dimensional position with sections shown either full size or 3-inch scale
 - 2. Samples:
 - a. One 8-inch- long section of wood for each profile and use with.
 - b. Two 8-inch by 8-inch wood panel samples with final finish.
- B. Product Data: For each type of component required. Include the following:
 - 1. Manufacturer's data on hardware, accessories, and finishes.

1.05 QUALITY ASSURANCE

- A. Quality Standards: Architectural Woodwork Quality Standards, Guide Specification and Quality Control Program as set forth by the Architectural Woodwork Institute (AWI).
- B. Architectural Woodwork Manufacturer: Experienced in this type of work; successfully completed comparable work.

- 1 C. Deviations from quality, grade, species, and finish specified under AWI Interior Woodwork for Transparent
2 Finish and Interior Woodwork for Paint Finish will be allowed for individual items or components only if
3 specified under separate headings covering such items.
4

5 1.06 DELIVERY, STORAGE AND HANDLING
6

- 7 A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and
8 deterioration.
9
10 B. Do not deliver finish carpentry materials until painting, wet work, grinding and similar operations which
11 could damage, soil or deteriorate woodwork have been completed.
12
13 C. If finish carpentry materials must be stored in other than installation areas, store only in areas meeting
14 requirements specified for installation areas.
15
16 1. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish
17 carpentry installation areas. Do not install finish carpentry until required temperature and relative
18 humidity have been stabilized and will be maintained in installation areas.
19 2. Maintain temperature and humidity in installation area as required to maintain moisture content of
20 installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of
21 installation through remainder of construction period. The fabricator of woodwork shall determine
22 optimum moisture content and required temperature and humidity conditions.
23

24 PART 2 - PRODUCTS
25

26 2.01 MATERIALS, GENERAL
27

- 28 A. Lumber standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with
29 applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of
30 Review.
31
32 B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the
33 following:
34 1. NELMA – Northeastern Lumber Manufacturers Association.
35 2. NHLA – National Hardwood Lumber Association.
36 3. NLGA – National Lumber Grades Authority.
37 4. SPIB - Southern Pine Inspection Bureau.
38 5. WCLIB – West Coast Lumber Inspection Bureau.
39 6. WWPA – Western Wood Products Association.
40
41 C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency
42 evidencing compliance with grading rule requirements and identifying grading agency, grade, species,
43 moisture content at time of surfacing, and mill.
44
45 D. For exposed lumber, furnish pieces with grade stamps applied to ends of back of each piece, or omit grade
46 stamps entirely and provide certificates of grade compliance issued by inspection agency.
47

48 2.02 INTERIOR TRIM
49

- 50 A. Interior: AWI 300 Custom Grade.
51 1. Species: Plain sawn, kiln-dried Red Oak.
52 2. Grade: AWI Lumber Grade III.
53 3. Texture: Surfaces (smooth).

1 4. Sight exposed, stain finish to be selected by AE.

2 5. Thickness: 3/4 inch, unless noted otherwise.

3
4 2.03 ACCESSORIES

5
6 A. Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application
7 to provide secure attachment, concealed where possible, and complying with applicable Federal
8 Specifications.

9
10 1. Nails, Wire, Brads and Staples: FS FF-N-105.

11 2. Power-Driven Fasteners: CABO NER-272.

12
13 B. Where interior finish carpentry materials are exposed in areas of high humidity, provide fasteners and
14 anchorages with hot-dip galvanized coating complying with ASTM A 153 or No. 304 stainless steel.

15
16 C. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

17
18 D. Sealants: Comply with requirements of Division 7 Section "Joint Sealants" for materials required for sealing
19 work.

20
21 2.04 FABRICATION

22
23 A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's
24 recommendations for moisture content of finish carpentry on relative humidity conditions existing during
25 time of fabrication and in installation areas.

26
27 B. Field Dimensions

28
29 1. Millwork Manufacturer: Responsible for details, dimensions not controlled by job conditions; show
30 on shop drawing all field measurements beyond his control. Contractor, Woodwork Manufacturer:
31 Cooperate to establish, maintain these field dimensions.

32
33 C. Leave all surfaces clean and true and all exposed wood surfaces sanded parallel with grain, free of discernible
34 marks and ready for work under Division 9 Section "Painting".

35
36 D. Cutouts: Make those required for mechanical and electrical items.

37
38 E. Back out or kerf backs of the following members, except members with ends exposed in finished work:

39
40 1. Standing and running trim wider than 5 inches.

41
42 F. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius.

43
44 G. Ease edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

45
46 H. Fabricate handrails to match existing handrail sizes and profiles and as indicated on Drawings.

47
48 PART 3 - EXECUTION

49
50 3.01 EXAMINATION

- 1 A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and
2 other conditions affecting installation and performance of finish carpentry. Do not proceed with installation
3 until unsatisfactory conditions have been corrected.
4
- 5 3.02 PREPARATION
6
- 7 A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
8
- 9 B. Examine substrate before installation. Verify that substrate is sound and plumb/level. Proceed with
10 installation only after unsatisfactory conditions have been corrected.
11
- 12 C. Wood frame walls shall be dry, clean, sound, well-nailed, free of voids, and without offsets at joints. Ensure
13 that nail heads are driven flush with surfaces.
14
- 15 D. Coordinate woodwork installation with wall flashings and other built-in components.
16
- 17 3.03 INSTALLATION
18
- 19 A. Do not use finish carpentry materials that are unsound, warped, improperly treaded or finished, inadequately
20 seasoned, or too small to fabricate with proper jointing arrangements.
21
- 22 1. Do not use manufactured units with defective surfaces, sizes or patterns.
23
- 24 B. Install finish carpentry plumb, level, true and aligned with adjacent materials. Use concealed shims where
25 required for alignment.
26
- 27 C. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
28
- 29 1. Countersink nails; fill surface flush and sand where face nailing is unavoidable.
30
- 31 D. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry with 1/32-
32 inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
33
- 34 E. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails.
35
- 36 1. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
37
- 38 F. Finish according to specified requirements.
39
- 40 1. Refer to Division 9 Sections for final finishing of finish carpentry.
41
- 42 3.04 STANDING AND RUNNING TRIM INSTALLATION
43
- 44 A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber
45 available. Do not use pieces less than 24 inches long, except where necessary.
46
- 47 1. Stagger joints in adjacent and related standing and running trim.
48 a. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact
49 throughout length of joint.
50 b. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness
51 across joints, if required.
- 52 B. Match color and grain pattern across joints.
53
- C. Drill pilot holes in wood before fastening as required to prevent splitting.

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- 1. Fasten to prevent movement or warping.
 - a. Countersink fastener heads on exposed carpentry work and fill holes.
 - b. Stagger nails along the length of long pieces of trim.

3.05 ADJUSTING

- A. Repair damaged or defective work as directed.
- B. Adjust and lubricate hardware for proper operation.

3.06 CLEANING

- A. Clean exposed surfaces.
- B. Clean shop-finished woodwork, touch-up finish as required and remove and refinish damaged or soiled areas of finish.
- C. Protect finish carpentry and maintain conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06 20 00

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SECTION 06 41 16

PLASTIC LAMINATE CLAD CASEWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Base, Wall and Custom Storage Cabinets and associated Partitions and Shelving.
- B. Hardware.

1.03 RELATED WORK

- A. Rough Carpentry: Section 06 10 00.
- B. Joint Sealers: Section 07 92 00.

1.04 REFERENCES

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

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

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

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver casework items only when proper storage conditions will be available. Store casework in protected area until ready for installation.

- 1
- 2 B. Maintain optimum humidity and temperature conditions after receipt of materials.
- 3
- 4 C. Store in manner to allow free circulation of air around all items.
- 5
- 6 D. Maintain temperature of casework storage areas between 50 to 75 degrees Fahrenheit.
- 7

8 PART 2 - PRODUCTS

9 2.01 CASEWORK

- 10
- 11
- 12 A. AWI Section 400, Custom grade.
- 13

14 2.02 MANUFACTURERS

- 15
- 16 A. The following casework manufacturers are acceptable as long as they meet or exceed this specification.

- 17 1. A.J. Pietsch Company, (414) 342-0531.
- 18 2. Carley Wood Associates, Inc. (608) 249-7444.
- 19 3. Central Wisconsin Woodworking, (715) 675-4491.
- 20 4. Creative Laminates, Inc., (800) 441-5885.
- 21 5. Diversified Woodcrafts Inc., (920) 842-2136.
- 22 6. Glenn Rieder, Inc., (414) 449-2888.
- 23 7. Hillcraft Ltd., (608) 221-3220.
- 24 8. Lange Brothers Woodwork Co, Inc., (414) 466-2226.
- 25 9. Stück Wood Works Inc., (414) 351-5595.
- 26 10. T. J. Hale Company, (262) 255-5555.
- 27 11. Techline, (608) 238-6868.
- 28 12. Wood Design Inc., (920) 563-4833.
- 29 13. Woodmill Products, Inc., (262) 754-4641.
- 30 14. Or approved equal.
- 31

- 32 B. Hardware manufacturers.

- 33 1. Doug Mockett & Co. (800) 523-1269.
- 34 2. A&M Hardware (888) 647-0200
- 35 3. Or approved equal.
- 36

37 2.03 BASE AND CUSTOM STORAGE CABINETS

- 38
- 39 A. Bottoms, Sides and Sub-top: 3/4-inch 45-47 pound density particle board.

- 40 1. Finish where not exposed: 8 to 11 mil melamine resin overlay.
- 41 2. Square edge profile.

- 42 B. Top of Base, Custom Storage Cabinet: Full framed wood. Provide full sub-top and 6 inch spreaders between
- 43 all drawers and door/drawer.
- 44

45 2.04 PLASTIC LAMINATE SURFACING

- 46
- 47 A. Manufacturers: Wilsonart, Arpa, Formica, Lamin-Art, Nevamar, or approved equal.
- 48

- 49 B. Exposed Exterior Surfaces (except countertops): NEMA GP28, 0.028 inch thick, standard vertical grade.
- 50

- 51 C. Interior Surfaces/Backing Sheets: NEMA CL20, 0.020 inch thick, standard cabinet liner grade if applicable.
- 52

- 53 D. Colors:
- 54

1 1. Horizontal Surface Plastic Laminate color to be selected from manufacturer's full range.

2
3 2.05 HARDWARE

4
5 A. Steel Brackets

6 1. For upper shelving and work surfaces: Hafele, Hebgo bracket, approved equal by A&M Hardware or
7 approved equal.

8 a. Color: To be selected by Architect from full line of powder coat finishes.

9 B. Grommets: provide 2 openings with grommet for cables.

10
11 2.06 WORKMANSHIP

12
13 A. Cabinet parts shall be accurately machined utilizing hardwood dowels for premium quality grade joinery
14 construction. Glue and mechanically fasten all joints for maximum rigidity.

15
16 B. All cases shall be square, plumb, true and self-supporting.

17
18 C. Provide removable back panels and closure panels for plumbing access where shown on Project Drawings.

19
20 PART 3 - EXECUTION

21
22 3.01 DELIVERY

23
24 A. Store and install in a ventilated building not exposed to extreme temperature and/or humidity.

25
26 3.02 INSTALLATION

27
28 A. Installation shall be by the manufacturer's authorized representatives using factory trained personnel
29 experienced in the installation of this type of equipment.

30
31 B. Uncrate, set up, place, level, scribe and anchor all cabinets according to manufacturer's recommendations.

32
33 C. Remove and replace tops, backs, panels, shelves and other items necessary to allow other Sections to
34 complete their work of connecting services.

35
36 D. Do all cutting, boring, patching required for the installation of work of other Sections.

37
38 E. Provide all necessary fillers, panels, end panels, scribes required to make complete installation as detailed.

39
40 F. Where casework meets wall surfaces, set with uniform space not to exceed 1/8-inch. Seal all joints with
41 silicone sealant to a slightly concave joint, using backer rod where required. Apply sealant in accord with
42 Section 07 92 00.

43
44 G. Cabinets with surfaces having machine or tool marks will be rejected.

45
46 H. All finishes must be smooth, uniform in color and match approved sample.

47
48 I. Prior to final inspection, examine installation of the work of this Section. Repair or replace all defects found.
49 Leave installation clean, undamaged and ready for use.

50
51 3.02 FINISH SCHEDULE

52 PLam Horizontal Surfaces To be selected by Architect.

53
54 END OF SECTION 06 41 16

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SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.
- B. Firestop systems shall be used in locations including, but not limited to, the following:
1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
 2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
 3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate on side of the barrier.
 4. Joints between fire resistance rated assemblies.
- C. Related Sections include, but are not limited to, the following:
1. Division 8 – Hollow Metal Doors and Frames, Aluminum Framed Entrances and Storefronts
 2. Division 9 – Gypsum Board
 3. Division 22 and 23 – Mechanical; Pipe and Duct
 4. Division 26 – Electrical; Lighting, Power, Alarms, and Communications

1.03 REFERENCES

- A. American Society For Testing and Materials Standards (ASTM):
1. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 2. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
 3. ASTM E 1966: Test Method for Resistance of Building Joint Systems.
 4. ASTM E 1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
 5. ASTM E 119: Methods of Fire Tests of Building Construction and Materials.
 6. ASTM E 2307: Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus
 7. ASTM E 2174: Standard Practice for On-Site Inspection of Installed Fire Stops
 8. ASTM E 2393: Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- B. Underwriters Laboratories Inc. (UL):
1. UL 723: Surface Burning Characteristics of Building Materials.
 2. UL 1479: Fire Tests of Through-Penetration Fire Stops.
 3. UL 2079: Tests for Fire Resistance of Building Joint Systems.
- C. UL Fire Resistance Directory -Volume 2:
1. Through-Penetration Firestop Devices (XHJI)

2. Fire Resistive Ratings (BXUV)
3. Through-Penetration Firestop Systems (XHEZ)
4. Fill, Void, or Cavity Material (XHHW)

D. Omega Point Laboratories (OPL)

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

1.04 DEFINITIONS

- A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating of that wall or floor.
- B. System: The use of a specific firestop material or combination of materials around a specific penetrant(s) or into a specific joint in conjunction with a specific wall and/or floor construction type.
- C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
- D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
- E. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.
- F. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire-rated barriers including where the top of a wall meets a floor; wall edge to wall edge configurations; floor edge to floor edge configurations; floor edge to wall configurations.
- G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire-rated floor assembly and a non-rated exterior wall assembly.
- H. Engineering Judgment: A firestopping assembly proposed for conditions where a tested and listed firestopping system does not exist.

1.05 PERFORMANCE REQUIREMENTS

- A. Penetrations: Provide through-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of barrier penetrated.
 1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of field conditions.
 2. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the barrier being penetrated.
 3. T-Rated Systems: Provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the Building Code.
 4. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 5. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E 1399 and E 1966), but not less than the fire resistance rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.

- 1 1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide
2 products that after curing do not deteriorate when exposed to these conditions both during
3 and after construction.
4 2. For floor penetrations exposed to possible loading and traffic, provide firestop systems
5 capable of supporting floor loads involved either by installing floor plates or by other means.
6
7 C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less
8 than 450, as determined per ASTM E 84.
9
10 D. Where there is no specific third party tested and classified firestop system available for an installed
11 condition, the firestopping contractor shall obtain from the firestopping material manufacturer an
12 Engineering Judgment (EJ) to be submitted to the Approving Authority and Authority Having
13 Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council
14 (IFC) guidelines.
15
16 1.06 SUBMITTALS
17
18 A. Submit in accordance General Conditions of Contract.
19
20 B. Product Data: For each type of firestopping product selected. Certify that firestopping materials are
21 asbestos free and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.
22
23 C. Design Listings: Submit system design listings, including illustrations, from a qualified testing and
24 inspecting agency that is applicable to each firestop configuration.
25
26 D. Where there is no specific third party tested and classified firestop system available for a particular
27 configuration, the firestopping contractor shall obtain from the firestopping material manufacturer
28 an Engineering Judgment (EJ) for submittal.
29
30 E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate
31 their capabilities and experience. Submit document from manufacturer wherein manufacturer
32 recognizes the installer as qualified.
33
34 1.07 QUALITY ASSURANCE
35
36 A. Provide firestopping system design listings from UL or OPL in accordance with the appropriate
37 ASTM Standard(s) per article 1.5.
38
39 B. Contractor Qualifications: An acceptable installer shall meet any two of the following requirements:
40 1. Licensed by State or Local Authority where applicable.
41 2. Trained and approved by the firestop manufacturer.
42 3. Shown to have successfully completed not less than 5 comparable scale projects.
43
44 C. Single Source Limitations: Obtain firestop systems, for each kind of penetration and construction
45 condition indicated from a single manufacturer, where possible.
46
47 D. Materials from different firestop manufacturers shall not be installed in the same firestop system or
48 opening.
49
50 E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of
51 hazardous solvents.
52
53 F. Firestopping sealants must be flexible, allowing for normal pipe movement.
54
55 G. Firestopping materials shall not crack or pull back from contact surfaces such that a void is created.
56

- 1 H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
- 2
- 3 I. Materials used shall be in accordance with the manufacturer's written installation instructions.
- 4
- 5 J. Label each firestopping system installation with the following information:
 - 6 1. Firestopping product name
 - 7 2. System listing number
 - 8 3. Name and address of manufacturer
 - 9
- 10 K. Inspection of penetrations through fire rated floor and wall assemblies shall be in accordance with
- 11 ASTM E 2174, Standard Practice for On-Site Inspection of Installed Fire Stops.
- 12
- 13 L. Inspection of fire resistive joints and perimeter barriers shall be in accordance with ASTM E 2393,
- 14 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire
- 15 Barriers

16
17 1.08 DELIVERY, STORAGE, AND HANDLING

- 18
- 19 A. Deliver firestopping products to Project site in original, unopened containers or packages with intact
- 20 and legible manufacturer's labels identifying product and manufacturer, date of manufacture, lot
- 21 number, UL or OPL classification marking, and mixing instructions for multi-component materials.
- 22
- 23 B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to
- 24 moisture, temperature changes, contaminants, or other causes.
- 25
- 26 C. All firestop materials shall be installed prior to expiration of shelf life.
- 27

28 1.09 PROJECT CONDITIONS

- 29
- 30 A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within
- 31 limits permitted by the manufacturer's written instructions. Do not install firestopping when
- 32 substrates are wet due to rain, frost, condensation, or other causes.
- 33
- 34 B. Ventilate per the manufacturer's written instructions on the product's Material Safety Data Sheet.
- 35
- 36 C. Verify the condition of the substrates before starting work.
- 37
- 38 D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate
- 39 adjacent surfaces.
- 40

41 1.10 COORDINATION

- 42
- 43 A. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are
- 44 installed according to specified requirements.
- 45
- 46 B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-
- 47 penetration firestop systems.
- 48
- 49 C. Do not conceal firestopping installations until the Owner's inspection agency or Authorities Having
- 50 Jurisdiction have examined each installation.
- 51
- 52 D. Schedule firestopping after installation of penetrants but prior to concealing the openings.
- 53

54 1.11 ENVIRONMENTAL REQUIREMENTS

55

- 1 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
2 (defined as inside the weatherproofing system and applied on site) must not exceed the following
3 requirements.
4 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
5 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
6 2005.
7 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
8 effect on October 19, 2000.
9

10 PART 2 - PRODUCTS

11
12 2.01 FIRESTOPPING, GENERAL

- 13
14 A. Firestopping products specified in system design listings by UL or OPL may be used providing they
15 conform to the construction type, penetrant type, annular space requirements, and fire rating
16 involved in each separate assembly.
17
18 B. Manufacturer of firestopping products shall have been successfully producing and supplying these
19 products for a period of not less than three years and be able to show evidence of at least ten projects
20 where similar products have been installed and accepted.
21
22 C. Accessories: Provide components for each firestop system that are needed to install fill materials
23 and to comply with "Performance Requirements" Article. Use only components specified by the
24 firestopping manufacturer and approved by UL or OPL for the firestop systems indicated.
25 Accessories include, but are not limited to the following items:
26 1. Permanent forming/damming/backing materials, including the following:
27 a. Mineral wool insulation.
28 b. Foams or sealants used to prevent leakage of fill materials in liquid state.
29 c. Fire-rated form board.
30 d. Polyethylene/polyurethane backer rod.
31 e. Rigid polystyrene board.
32 f. Temporary forming materials.
33 g. Substrate primers.
34 h. Steel sleeves
35
36 D. All firestopping products and systems shall be designed and installed so that the basic sealing
37 system will allow the full restoration of the fire resistance properties of the barrier being penetrated
38 with minimal repair if penetrants are subsequently removed.
39

40 2.02 MIXING

- 41
42 A. For those products requiring mixing before application, comply with firestopping manufacturer's
43 written instructions for accurate proportioning of materials, water (if required), type of mixing
44 equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures
45 needed to produce products of uniform quality with optimum performance characteristics for
46 application indicated.
47

48 2.03 MANUFACTURERS

- 49
50 A. Subject to compliance with the requirements, provide products by one of the following:
51 1. Grace Construction Products, 62 Whittemore Ave, Cambridge MA 02140, (866) 333-3726.
52 2. Hilti USA; 5400 S. 122nd E. Ave, Tulsa, OK 74146 (800) 445-8827
53 3. 3M Fire Protection; 3M Center, St. Paul, MN 55144 (888) 364-3577
54 4. Or Approved Equal.
55

56 2.04 MATERIALS

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- A. Intumescent Firestop Sealants and Caulks:
 - 1. FlameSafe FS1900
 - 2. Or Approved Equal

- B. Elastomeric Water-Based Sealant:
 - 1. FlameSafe FS1900, FS900
 - 2. Or Approved Equal

- C. Elastomeric Silicone Sealant:
 - 1. FlameSafe Silicone
 - 2. Or Approved Equal

- D. Firestop Putty:
 - 1. FlameSafe FSP1000 Putty & FSP1077 Putty Pads
 - 2. Or Approved Equal

- E. Firestop Devices:
 - 1. FlameSafe FSWS Collar, FSIS Intumescent Sleeve, FlameSafe FSD Device
 - 2. Or Approved Equal

- F. Wrap Strips:
 - 1. FlameSafe FSWS 100 Wrap Strip, FSWS 150 Wrap Strip
 - 2. Or Approved Equal

- G. Firestop Mortars:
 - 1. FlameSafe FSM Mortar
 - 2. Or Approved Equal

- H. Firestop Bags/Pillows:
 - 1. FlameSafe Bags, FlameSafe Pillows
 - 2. Or Approved Equal

- I. Elastomeric Coating:
 - 1. FlameSafe FS3000
 - 2. Or Approved Equal

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

- C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.

- 1 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of
- 2 developing optimum bond with firestop systems. Remove loose particles remaining from
- 3 cleaning operation.
- 4 3. Remove laitance and form-release agents from concrete.

5
6 3.03 PENETRATION FIRESTOP SYSTEMS

- 7
- 8 A. General: Install through-penetration firestop systems to comply with “Performance Requirements”
- 9 article in Part 1 and firestopping manufacturer’s written installation instructions and published
- 10 drawings for products and applications indicated.
- 11
- 12 B. Installation of firestopping shall be performed by an applicator/installer qualified as described in
- 13 article 1.7.
- 14
- 15 C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer’s EJ per
- 16 the manufacturer’s installation instructions.
- 17
- 18 D. Install forming/damming/backing materials and other accessories required to support fill materials
- 19 during their application and in the position needed to produce cross-sectional shapes and depths
- 20 required to achieve fire resistance ratings required.
- 21
- 22 E. Install fill materials for firestop systems by proven techniques to produce the following results:
- 23 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating
- 24 items as required to achieve fire-resistance ratings indicated.
- 25 2. Apply materials so they fully contact and adhere to substrates formed by openings and
- 26 penetrating items.
- 27 3. For fill materials that will remain exposed after completing Work, finish to produce smooth,
- 28 uniform surfaces that are flush with adjoining finishes.
- 29

30 3.04 JOINT FIRESTOP SYSTEMS

31
32 General: Install fire resistive joint firestop systems to comply with “Performance Requirements” article in Part

- 33 1 and firestopping manufacturer’s written installation instructions and published drawings for products and
- 34 applications indicated. System to meet UL2079-"Tests for Fire Resistance of Building Joint Systems.
- 35
- 36 A. Installation of firestopping shall be performed by an applicator/installer qualified as described in
- 37 article 1.7.
- 38
- 39 B. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer’s
- 40 Engineered Judgment per the manufacturer’s installation instructions.
- 41
- 42 C. Install joint forming/damming materials and other accessories required to support fill materials
- 43 during their application and in the position needed to produce cross-sectional shapes and depths of
- 44 installed firestopping material relative to joint widths that allow optimum movement capability and
- 45 achieve fire resistance ratings required.
- 46
- 47 D. Install fill materials for firestop systems by proven techniques to produce the following results:
- 48 1. Fill joint as required to achieve fire-resistance ratings indicated.
- 49 2. Apply materials so they fully contact and adhere to substrates forming the openings.
- 50 3. Completely fill recesses provided for each joint configuration.
- 51 4. Tool non-sag firestop materials after their application and prior to the time skinning begins.
- 52 Use tooling agents approved by the firestopping manufacturer.
- 53

54 3.05 FIELD QUALITY CONTROL

55

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

3
4 3.06 CLEANING AND PROTECTION

5
6 A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with
7 cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not
8 damage materials in which openings occur. Leave finished work in neat, clean condition with no
9 evidence of spillovers or damage to adjacent surfaces.

10
11 B. Provide final protection and maintain conditions during and after installation that ensure firestop
12 systems are without damage or deterioration at time of Substantial Completion. If, despite such
13 protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop
14 systems immediately and install new materials to produce firestop systems complying with specified
15 requirements.

16
17 END OF SECTION 07 84 00

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Miscellaneous Joints.

1.03 RELATED WORK

- A. Hollow Metal Doors and Frames Section 08 11 13.

1.04 SUBMITTALS

- A. Submit in accord with General Conditions of Contract.
 - 1. Samples: Color range of material for selection.
 - 2. Manufacturer's Recommendations including performance requirements, recommendations and application instructions for approval of materials used.

1.05 PROJECT CONDITIONS

- A. Examine the joint surfaces and backing, and their anchorage to the structure, and the conditions under which the joint sealer work is to be performed. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected.
- B. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

PART 2 - PRODUCTS

2.01 SEALANT

- A. Sealant for Locations Except as Specified in the Subsequent Paragraphs: PECORA Dynatrol I-XL, Degussa Sonneborn Sonolastic NP-1, TREMCO Dymonic, or other acceptable, one part polyurethane.
 - 1. Comparable means both quality and color options.
 - 2. VOC content limit: 100 g/L, less water and less exempt compounds.
- B. Horizontal Joint Sealant: PECORA NR-200 Urexpam, Sonolastic SL2, TREMCO THC-900, or other acceptable 2-part self-leveling polyurethane.
 - 1. Comparable means both quality and color options.

2.02 SEALANT ACCESSORIES

- 1 A. Primer: When required, as recommended by the Sealant Manufacturer.
2
3 B. Closed Cell Back-up (Backer Rod): Tremco "Closed Cell Backer Rod", Sonneborne "Sonofoam" or W.R.
4 Meadows "Kool-Rod".
5

6 PART 3 - EXECUTION

7
8 3.01 JOINT PREPARATION

- 9
10 A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and
11 other substances which would interfere with bond of sealant. Etch concrete and masonry joint surfaces as
12 recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces as recommended by
13 sealant manufacturer.
14
15 B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow
16 primer/sealer to spill or migrate onto adjoining surfaces.
17

18 3.02 SEALANT APPLICATION, GENERAL

- 19
20 A. Set joint filler units at proper depth or position in the joint to coordinate with other work, including the
21 installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint
22 filler units.
23
24 B. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to
25 ensure that elastomeric sealants will perform properly.
26
27 C. Apply compound with a gun having proper size nozzle or with a knife, as required. Use sufficient pressure to
28 fill all voids and joints solid. Remove excess sealant and leave surfaces smooth, neat and clean. Upon
29 completion sealant shall have a smooth, even finish and all joints shall be weathertight. All work shall be in
30 accordance with manufacturer's printed instructions.
31
32 D. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids
33 of adjoining surfaces. Clean the adjoining surfaces by whatever means may be necessary to eliminate
34 evidence of spillage.
35

36 3.03 PROTECTION

- 37
38 A. Cure sealants in compliance with manufacturer's instructions and recommendations. Advise the Contractor of
39 procedures required for the cure and protection of joint sealers during the construction period, so that they
40 will be without deterioration or damage (other than normal wear and weathering) at the time of Substantial
41 Completion.
42
43
44

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Steel Frames.

1.03 RELATED WORK

- A. Joint Sealers: Section 07 92 00.
- B. Door Hardware: Section 08 71 00.
- C. Painting: Section 09 90 00.

1.04 REFERENCES

- A. Comply with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Doors: Comply with NFPA 80 "Standard for Fire Doors and Windows." and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
- C. ANSI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
- D. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
- E. ANSI A250.5 Accelerated Physical Endurance Test Procedure for Steel Doors, Frames, and Frame Anchors.
- F. ANSI A250.8 Nomenclature for Standard Steel Doors and Steel Door Frames.
- G. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- H. ANSI/DHI A115 Specifications for Hardware Preparations in Standard Steel Doors and Frames.
- I. ANSI/DHI A115.1G Installation Guide for Doors and Hardware.
- J. SDI-105-92 Recommended Erection Instructions for Steel Frames.
- K. SDI-106 Recommended Standard Door Type Nomenclature.

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- L. SDI-111 Recommended Standard Details Steel Doors and Frames.
 - M. SDI-117-93 Manufacturing Tolerances Standard Steel Doors and Frames.
 - N. SDI-122-90 Installation and Troubleshooting Guide for Standard Doors and Frames.
 - O. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
 - P. ASTM A240/A240M Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel.
 - Q. ASTM A366 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 - R. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.
 - S. ASTM A569 Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
 - T. ASTM A620 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Drawing Quality, Special Killed.
 - U. NFPA-101-94: Life Safety Code.
 - V. NFPA 251: Fire Tests of Building Construction and Materials.
 - W. NFPA 252: Fire Tests of Door Assemblies.
 - X. UL 9: Fire Tests of Door Assemblies.
 - Y. UL 10B: Fire Tests of Door Assemblies.
 - Z. UL 263: Fire Tests of Building Construction and Materials.
- 1.05 SUBMITTALS
- A. Submit in accordance with General Conditions of Contract.
 - 1. Manufacturer's technical product data substantiating that products comply with requirements.
 - 2. Shop Drawings for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - a. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 - b. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- 1.06 QUALITY ASSURANCE
- A. Comply with requirements of Steel Door Institute Standard SDI-100, "Recommended Specifications for Standard Steel Door and Frames", U.S. Department of Commerce Standard PS4-66, relative to manufacture of 1-3/4 inch thick flush steel doors, and applicable requirements of ANSI A115.
 - B. Factory machine frames for hardware requiring routing and mortising.

- 1
2 C. Fire-Rated Door Assemblies: Label, testing and installation of opening protectives shall be in accordance
3 with Wisconsin Building Code Section 715.
4
5 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide
6 certification by a qualified testing agency that doors comply with standard construction requirements
7 for tested and labeled fire-rated door assemblies except for size.
8
9 D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

10
11 1.07 DELIVERY, STORAGE, AND HANDLING
12

- 13 A. Deliver hollow metal work in cartons or crates to provide protection during transit and job storage.
14
15 B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished
16 items are equal in all respects to new work and acceptable to AE; otherwise, remove and replace damaged
17 items as directed.
18
19 C. Store doors and frames at building site under cover. Place units on minimum 4 inch high wood blocking.
20 Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber. If cardboard
21 wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to
22 promote air circulation.
23

24 1.08 PROJECT CONDITIONS
25

- 26 A. Examine the openings and conditions under which hollow metal work is to be installed. Do not proceed with
27 the work until unsatisfactory conditions have been corrected.
28

29 PART 2 - PRODUCTS
30

31 2.01 MANUFACTURERS
32

- 33 A. Amweld Building Products
34
35 B. Benchmark Commercial Doors
36
37 C. Ceco Door Products
38
39 D. Curries Company
40
41 E. Deansteel Manufacturing Co.
42
43 F. Fenestra, Inc.
44
45 G. Kewaunee Corporation
46
47 H. Krieger Steel Products
48
49 I. Mesker Door , Inc.
50
51 J. Pioneer Industries, Inc.
52
53 K. Precision Metals, Inc.

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L. Republic Builder Products

M. Security Metal Products Corp.

N. Steelcraft

O. Trussbuilt, Inc.

P. Williamsburg Steel Products Co

Q. Or approved equal.

2.02 MATERIALS

A. Steel: Commercial quality, level, cold-rolled steel conforming to ASTM A366, free of scale and surface defects. Commercial quality hot rolled and pickled steel conforming to ASTM A569 may be used as option for interior frames. Gauges are as follows:

1. Interior Frames: 16-gage.
2. Rough Bucks and Stiffeners: 12-gage.
3. Miscellaneous Trim: 16 gage.

2.03 FABRICATION, GENERAL

A. Make hardware mortises and reinforcements according to templates. Provide hinge, lock, door holder and closer hardware reinforcements. Mortise, drill tap for hardware; fabricate grooves, rabbets as necessary for weatherstripping.

B. Provide proper Underwriters' Laboratory (UL) labels. Labeled doors shall have equal labeled frames.

C. Clearances

1. Edge clearances shall be provided as follows:
 - a. Between doors and frame, at head and jambs - 1/8 inch.
 - b. At door sills:
 - 1) Where no threshold is used - 3/8 minimum.
 - 2) Where threshold is used - 1/4 inch maximum between door & threshold.

2.04 HOLLOW METAL FRAME FABRICATION

A. Provide metal frames of the types and styles indicated on the drawings or schedules and complying with SDI 100 for materials and construction requirements.

B. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, as shown on drawings.

C. All frames shall have mitered corners, be internally welded and ground smooth and provided with floor anchors.

D. Provide one removable and one fixed stop at perimeter of openings for glazed frames. Removable stop on secure side.

E. Provide closed metal covers over all hardware cutouts to protect against mortar.

- 1
2 F. Provide integral channel frames, sub-frames and stiffeners to structure where indicated or required for
3 fastening and stiffening frames.
4
5 G. Provide steel spreader temporarily attached to feet of both jambs for welded frames.
6
7 H. Provide three factory installed silencers on single door frames at strike jamb.
8
9 I. Completely clean all frames by degreasing process, followed by one coat rust inhibitive primer equal to
10 withstand a salt spray test (5% solution) of 70 hours. Thoroughly prime all surfaces without runs, smears, or
11 bare spots, and under and inside all removable stops.
12
13 J. Where required frames to be prepped for electric strike.
14
15 K. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes
16 clear during construction.
17 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
18 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
19

20 PART 3 - EXECUTION

21
22 3.01 INSTALLATION

- 23
24 A. Install steel frames, and accessories in accordance with final shop drawings, manufacturer's data, and as
25 herein specified.
26
27 B. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise
28 indicated.
29 1. Except for frames located at in-place concrete or masonry and at drywall installations, place frames
30 prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed,
31 aligned, and braced securely until permanent anchors are set. After wall construction is completed,
32 remove temporary braces and spreaders leaving surfaces smooth and undamaged.
33 2. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel
34 stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach
35 wall anchors to studs with self-tapping screws.
36 3. Fill heads of fasteners with body putty, grind smooth and touch-up prime.
37
38 C. Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
39 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are
40 set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and
41 undamaged.
42 a. At fire-protection-rated openings, install frames according to NFPA 80.
43 b. Where frames are fabricated in sections because of shipping or handling limitations, field
44 splice at approved locations by welding face joint continuously; grind, fill, dress, and make
45 splice smooth, flush, and invisible on exposed faces.
46 c. Install frames with removable glazing stops located on secure side of opening.
47 d. Install door silencers in frames before grouting.
48 e. Remove temporary braces necessary for installation only after frames have been properly set
49 and secured.
50 f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary
51 to comply with installation tolerances.
52 g. Field apply bituminous coating to backs of frames that are filled with grout containing
53 antifreezing agents.

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3.02 ADJUSTING

- A. Immediately after erection sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Check and readjust operating finish hardware items, leaving steel frames undamaged and in complete and proper operating condition.

END OF SECTION 08 11 13

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Wood Doors

1.03 RELATED WORK

- A. Hollow Metal Doors and Frames: Section 08 11 13.
B. Aluminum-Framed Entrances and Storefronts: 08 41 13.
C. Door Hardware: Section 08 71 00.
D. Glass and Glazing: Section 08 80 00.
E. Painting: Section 09 90 00, for re-finishing of planed and cut surfaces.

1.04 REFERENCES

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

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract
1. Manufacturer's product data, specifications and installation instructions for each type of wood door.
 - a. Including information on recycled content.
 2. Color charts of wood finishes for initial selection.
 3. (2) 10" x 10" wood samples with finish for final selection.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "on-site care" recommendations of National Wood Window and Door Association (WDMA) pamphlet "Care and Finishing Wood Doors" and with manufacturer's instructions.
1. Provide protective coverings for doors at the factory prior to shipping. Use heavy paper cartons or poly bags and mark with identification required for proper installation.
- B. Deliver and store within enclosed building only after humidity contributing work is completed and relative humidity is less than 50%. Stack doors laid flat, level and off floor, in dry, clean, well ventilated space.

1 C. Do not drag doors across one another.

2
3 1.07 WARRANTY

4
5 A. Submit in duplicate manufacturer's written warranty per NWWDA Standard Door warranty but extending for
6 life of installation for interior solid core doors, including refinishing and re-hanging costs for replacement
7 doors.

8
9 PART 2 - PRODUCTS

10
11 2.01 MANUFACTURERS

12
13 A. Algoma Hardwoods, Inc.; Algoma, Wisconsin; (920) 487-5221.

14
15 B. Eggers Industries; Two Rivers, Wisconsin: (920) 793-1351.

16
17 C. Graham Division, Assa Abloy Door Group LLC; Mason City, Iowa: (641) 423-2444.

18
19 D. Mohawk Flush Doors, Inc.; South Bend, Indiana: (574) 288-4464.

20
21 E. Marshfield Door Systems; Marshfield, Wisconsin: (800) 869-3667.

22
23 F. Oshkosh Architectural Door Company; Oshkosh, Wisconsin: (920) 233-6161.

24
25 G. VT Industries; Holstein, Iowa; (800) 827-1615.

26
27 2.02 MANUFACTURED UNITS

28
29 A. Non-labeled Interior Wood Veneer Solid Core Doors: AWI type PC-5/7, Custom Grade.

30 1. Core: Particleboard or agri-fiber with minimum 40% post-industrial, recycled content as certified by
31 an independent, third party certification agency.

32 2. Veneer: Book matched, Red Oak, Rift Cut.

33 3. Species of stiles to match face veneer.

34 4. Transparent Finish: Factory finish to AWI section 1500, Custom standards.

35 a. Water-based stain with ultra-violet (UV) cured topcoats.

36 b. Sheen: Satin.

37 5. Color: Finish to match stain finish of existing wood doors, as approved by A/E.

38
39 B. Labeled Interior Wood Veneer Solid Core Doors: AWI FD.

40 1. Edge Banding: Laminated.

41 2. Veneer: Same as non-labeled doors.

42 3. Species of stiles to match face veneer.

43 4. Transparent Finish: Factory finish to AWI section 1500, Custom standards.

44 a. Water-based stain with ultra-violet (UV) cured topcoats.

45 b. Sheen: Satin.

46 5. Color: Finish to match stain finish of existing wood doors, Algoma custom stain RA-17257 or
47 LaForce Masonite Custom Color 256052C, as approved by A/E.

48 6. Provide mineral core blocking at closers.

49
50 C. Hardware location per manufacturer's recommendations to meet ADA requirements.

51
52 D. Glazed Openings

53 1. Provide factory glazed units.

2. Cut openings.
3. At non-labeled doors, provide detailed stops of same species as wood veneer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that door frames are of type required for door and are installed as required for proper installation of doors.
- B. Do not install doors in frames which would hinder the operation of the doors.

3.02 INSTALLATION

- A. Do not install in improperly installed frames.
- B. Fit for width by planing. For height, saw, first from bottom, then not over 1/2 inch from top. Bevel lock and hinges edge 1/8 inch in 2 inches.
- C. Provide 3/32 inch clearance between door and frame and 3/8 inch clearance between bottom of door and finish flooring.
- D. Seal all job site cut surfaces with stain to match existing and two coats of varnish.

3.03 ADJUST AND CLEAN

- A. Replace or re-hang doors which are hingebound and do not swing or operate properly.
- B. Refinish or replace job finished doors damaged prior to Substantial Completion.

END OF SECTION 08 14 00

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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Aluminum Frames.
- B. Accessories for a Complete Installation.

1.03 RELATED WORK

- A. Door Hardware: Section 08 71 00, for door hardware to be installed under this section.
- B. Flush Wood Doors: Section 08 14 16.

1.04 QUALITY ASSURANCE

- A. Installer shall be an authorized representative of the door manufacturer for both installation and maintenance of type of units required for this Project.
- B. Installer: Not less than 2 year's experience in the installation and service of entrance doors of the same manufacturer.
- C. Fenestration must comply with a minimum testing performance requirements for an AAMA/NWWDA 101/1.S.2 HC-40 rating. The recognized standard for performance ratings of windows is AAMA/NWWDA 101/1.S.2.
- D. Comply with the manufacturers requirements and the following. In case of conflict, comply with the most stringent.
 - 1. NAAMM-Metal Finishes Manual, National Association of Architectural Metal Manufacturers.
 - 2. ASTM B221- Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.
 - 3. ASTM B244 – Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals With Eddy-Current Instructions.
 - 4. NFPA 80-Fire Doors and Windows.
 - 5. NFPA 252 – Fire Test for Doors Assemblies.
 - 6. UBC Standar4d 7 – 2 - Fire Test of Doors Assemblies: Positive pressure testing.

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract
 - 1. Manufacturer's product data and standard details for doors, including fabrication, finishing, hardware, accessories and other components of the work. Include roughing-in diagrams, wiring diagrams, parts lists, and maintenance instructions.

2. Furnish templates, diagrams and other data to fabricators and installers of related work as needed for coordination of installation.
3. Shop Drawings: Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details.
4. Samples
 - a. Frame Color: Two 10-inch extrusions with finish, properly labeled.
 - b. Corner of Frame: Sample to include fit, finish and tolerance of frame corner joint.
5. Owner's Manual: Submitted prior to Substantial Completion. Include recommendations for maintenance, repair.

1.06 MAUFACTURER/FABRICATOR AND INSTALLER QUALIFICATIONS

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

PART 2 - PRODUCTS

2.01 ALUMINUM FRAMES

- A. Kawneer Trifab 400 Framing System.
- B. Or approved equal by:
 1. Omega Door Frame Products, Inc., Itasca, IL.
 2. ARCH Aluminum & Glass Co., Inc.
 3. Efcó
 4. Tubelite
 5. United States Aluminum
 6. Vistawall Architectural Products.
 7. Wausau Window Wall System.
 8. YKK AP America Inc.

2.02 FINISH

- A. Clear Anodized.

2.03 DOOR HARDWARE

- A. Hardware: See Section 08 71 00 for hardware to be supplied by Section 08 71 00 for installation under this section.
- B. All hardware shall be secured to aluminum door and frame members with a drill-and-tap screw fastener. Stripping of threads or other means of hardware attachment shall be cause for rejection of the entire assembly without additional cost to the Owner.

2.04 FRAME ACCESSORIES

- 1
2 A. Fasteners: Manufacturer's standard.
3
4 B. Sealant for Locations Except as Specified in the Subsequent Paragraphs: PECORA Dynatrol I, Sonolastic
5 NP-1, TREMCO Dymonic, or other acceptable one part polyurethane.
6
7 1. Comparable means both quality and color options.
8
9 C. Primers: Of type recommended by sealant manufacturer.
10
11 D. Back-up Materials: Non-staining type, compatible with sealant used; of a compressible nature, such as
12 resilient foams, sponge rubber rod stock, glass fibers, untreated jute. Do not use materials impregnated with
13 oils, asphalt or similar materials that are likely to bleed solvents, oils.
14
15 E. Aluminum Cover/Closure Plates: 1/8" thick aluminum sheet in same finish as frames.
16

17 PART 3 - EXECUTION

18
19 3.01 PREPARATION

- 20
21 A. Take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of
22 work.
23

24 3.02 INSTALLATION

- 25
26 A. Comply with manufacturer's specifications and recommendations.
27
28 B. Set units plumb, level and true to line, without warp or rack of frames or doors. Anchor securely in place.
29 Separate aluminum and other metal surfaces from sources of corrosion or electrolytic action at points of
30 contact.
31
32 C. Accurately assemble joints and corners. Match components, ensuring continuity of line and design. Ensure
33 joints and connections are flush and hairline.
34
35 D. Use sufficient anchorage devices to securely and rigidly fasten frame assemblies in place.
36

37 3.03 ADJUSTING

- 38
39 A. Lubricate operating equipment and clean exposed surfaces.
40

41 3.04 CLEANING

- 42
43 A. Clean aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt
44 and other substances.
45

46 3.05 PROTECTION

- 47
48 A. Institute protective measures and other precautions required to assure that entrance doors will be without
49 damage or deterioration at time of Substantial Completion.
50
51

52
END OF SECTION 08 41 13

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Door Hardware.

1.03 RELATED SECTIONS

- A. Hollow Metal Doors and Frames: Section 08 11 13.
- B. Aluminum-Framed Entrances and Storefronts: Section 08 41 13.
- C. Flush Wood Doors: Section 08 14 16.

1.04 REFERENCES

- A. Federal Specifications (FS)
 - 1. FF-H-106a Hardware, Builders'; Locks and Door Trim-Standard Finishes for Builders Hardware.
- B. National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269.
 - 1. NFPA 80 - Standard for fire doors and windows.
 - 2. NFPA 101 - Code for safety to life from fire in buildings and structures.
- C. Underwriter's Laboratories, Inc. (UL), 333 Pfingsten Road, Northbrook, IL 60062.
 - 1. Building Materials Directory.
- D. Hardware shall be in strict accord with Wisconsin Administrative Code Chapter Comm. 69 - "Barrier Free Design".

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract.
 - 1. A detailed, vertical type hardware schedule for approval.
 - a. List and describe each opening separately. Include doors with identical hardware, except hand, in a single heading. Include door number, room designations, degree of swing, and hand.
 - b. List related details. Include dimensions, door and frame material, and other conditions affecting hardware.
 - c. List all hardware items. Include manufacturer's name, quantity, product name, catalog number, size, finish, attachments, and related details.
 - d. Resubmit corrected schedule when required.
 - e. Determine keying requirements, as directed by the Owner's Representative and submit a detailed keying schedule for approval; resubmit the corrected schedule when required.

- 1 2. Samples of hardware items as may be required. Identify each sample and indicate the location of
2 subsequent installation in the project.
3 3. Provide approved hardware schedule and all pertinent templates or template information to each fabricator
4 of material factory-prepared for the installation of hardware.
5

6 1.06 QUALITY ASSURANCE
7

- 8 A. Manufacturers and product numbers listed herein establish a standard of quality. Similar items by other
9 manufacturers may be accepted by prior approval in accord with the General Conditions of Contract. Except
10 where specified in the hardware schedule, furnish products of only one manufacturer for each type of hardware.
11
12 B. Supplier: Company specializing in the builders' hardware industry.
13
14 C. Items of hardware not definitely specified herein but necessary for completion of the Work shall be provided.
15 Such items shall be of type and quality suitable to the service required and comparable to the adjacent
16 hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be
17 furnished of suitable types having as nearly as practicable the same operation and quality as the type specified.
18 Sizes shall be adequate for the service required. Include such nuances as strike type, strike lip, raised barrel
19 hinges, mounting brackets, fasteners, shims, and coordination between conflicting products. All doors shall be
20 provided with a stop.
21

22 1.07 REGULATORY REQUIREMENTS
23

- 24 A. Furnish UL listed hardware for all UL labeled openings in conformance with requirements for the class of
25 opening scheduled.
26

27 1.08 DELIVERY, STORAGE AND HANDLING
28

- 29 A. Deliver hardware to the job site in the manufacturer's original containers marked to correspond with the
30 approved hardware schedule for installation location.
31
32 B. Store hardware in dry surroundings and protect against loss and damage.
33

34 PART 2 - PRODUCTS
35

36 2.01 MANUFACTURERS
37

- 38 A. Refer to the Hardware Schedule at the end of this Section.
39

40 2.02 ACCESSORIES
41

- 42 A. Furnish all necessary hardware accessories such as wood or machine screws, bolts, nuts, anchors, toggle bolts,
43 and other fasteners, each of the type, size, material and finish for its intended purpose and each according to the
44 material to which the hardware is being applied.
45
46 B. Keying system will be determined by the Owner's Representative.
47

48 PART 3 - EXECUTION
49

50 3.01 INSTALLATION
51

- 52 A. Install hardware in accordance with manufacturer's recommendations and instructions.
53

- 1 B. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain the fire
- 2 rating.
- 3
- 4 C. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.
- 5
- 6 D. Remove, cover or protect hardware after fitting until paint or other finish is applied. Permanently install
- 7 hardware after finishing operations are complete.
- 8
- 9 E. Install closers on the room side of corridor doors, stair side of stairways, and interior side of exterior doors.
- 10
- 11 F. Deliver one complete set of installation and adjustment instructions, and tools with the hardware.
- 12
- 13 G. Coordinate security system electrical requirements at doors indicated to have such system.
- 14
- 15 H. Coordinate all Owner Furnished Owner Installed hardware.

16
17 3.02 ADJUSTING

- 18
- 19 A. At final completion, adjust and test all hardware for function and performance and leave in good operating
- 20 condition.
- 21

22 3.03 CLEANING

- 23
- 24 A. Clean all hardware to restore the original finish.
- 25

26 3.04 PROTECTION

- 27
- 28 A. Protect the finished installation until acceptance of the project.
- 29

30 3.05 HARDWARE SCHEDULE

31
32 A. Manufacturers

33	1. Hinges	Hager Hinge Co.	HAG
34	a. Approved Equals:	Stanley	
35		McKinney	
36	2. Lockset	Best Access Systems	BES
37	a. Approved Equals:	No substitutions. Provide 7-pin cylinders to match existing. Coordinate	
38		with Best Access Systems for keying of project.	
39	3. Door Closers	Stanley Security Solutions	STA
40	a. Approved Equals:	LCN, Model 4040	
41		Sargent, Model 351	
42	4. Kickplate	Rockwood Mfg. Co	ROC
43	5. Biometric Hand Readers	Schlage Recognition Systems	SCH
44	6. Electric Strikes	Von Duprin	VON
45	a. Approved Equals:	HES	
46		Folger Adams	
47	7. Door Position Switch	Locknetics	LCK

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B. Hardware Sets:

SET 01

Opening(s):

3 EA	HINGES	BB1279	652	HAG
1 EA	PASSAGE SET	93K N x 14D	626	BES
1 EA	WALL STOP	WS407	630	IVE

SET 02

Opening(s):

3 EA	HINGES	BB1279	652	HAG
1 EA	PASSAGE SET	93K N x 14D	626	BES
1 EA	OVERHEAD STOP	100S	630	GLY

SET 03

Opening(s): 3006b

3 EA	HINGES	BB1279	652	HAG
1 EA	STOREROOM LOCK	93K D x 14D	626	BES
1 EA	WALL STOP	WS407	630	IVE

Install Double Clothes/Robe Hook on back of all office doors

1 EA	Bobrick B-6727			
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END OF SECTION 08 71 00

SECTION 08 80 00
GLASS AND GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Glass in Hollow Metal Frames.
- B. Glass in Wood Doors.

1.03 RELATED WORK

- A. Joint Sealers: Section 07 92 00.
- B. Flush Wood Doors: Section 08 14 16.

1.04 REFERENCES

- A. Reference Specification: "Glazing Manual", by Flat Glass Marketing Association.
- B. Materials: Conform in all respects to the "Safety Standard for Architectural Glazing Materials", 16CFR 1201, issued by the Consumer Product Safety Commission.

1.05 QUALITY ASSURANCE

- A. All materials used for this project shall be from the same batch run and manufacturer.
- B. Sound Transmission Resistance; Sound Transmission Class (STC) for typical application to be minimum of 32; AS tested by ASTM E4134.
- C. All performance testing must be conducted by an independent, impartial, third party, AAMA certified testing laboratory.

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract.
 - 1. Manufacturer's recommended installation instructions.
 - 2. Two samples of each type of glass specified.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Package, handle, deliver and store to avoid damage. Scratched glass will be rejected.

1.07 PROJECT CONDITIONS

- 1 A. Do not proceed with installation of liquid sealants under adverse weather conditions, or when temperatures are
2 below or above manufacturer's recommended limitations for installation.
3

4 PART 2 - PRODUCTS

5
6 2.01 MANUFACTURERS

- 7
8 A. Acceptable Manufacturers/Suppliers:

- 9
10 1. ACH Glass Operations
11 2. AFG Industries, Inc.
12 3. Altuglas International
13 4. Cyro Industries
14 5. Guardian Industries
15 6. Interpane
16 7. Misco
17 8. Oldcastle
18 9. Pilkington
19 10. Plaskolite, Inc.
20 11. PPG Industries
21 12. Saint-Gobain Glass
22 13. Solutia Inc.
23 14. Viracon
24

25 2.02 GLASS

- 26
27 A. Some of the glass products indicated below are based on proprietary products. Products from any of the above
28 listed manufacturers that meet the design criteria of the glass specified below are acceptable.
29
30 1. GLT 4: 1/4" tempered, clear, FS DD-G-451, Grade B, Style 1, Type I, class 1, quality q3, free of tong
31 marks, ANSI Z97.1.
32

33 2.03 GLAZING ACCESSORIES

- 34
35 A. Glazing Sealant: One-part silicone equal to Pecora 860, Sonneborn Omnipus or Tremco Spectrum 2.
36 1. Equal means both quality and color options.
37
38 B. Setting Blocks: 70-90 Shore "A" durometer, sized to accommodate size of glass used, compatible with glazing
39 sealant.
40
41 C. Spacers: Compatible with sealant used.
42
43 D. Primer, Sealers, Glazing Tape, Cleaners: As recommended by glass manufacturer.
44
45

46 PART 3 - EXECUTION

47
48 3.01 EXAMINATION

- 49
50 A. Check that glazing channels are free of burrs, irregularities, and debris.
51
52 B. Check that glass is free of edge damage or face imperfections.
53

1 C. Do not proceed with installation until conditions are satisfactory.

2

3 3.02 PREPARATION

4

5 A. Field Measurement.

6 1. Measure size of frame to receive glass.

7 2. Compute actual glass size, allowing for edge clearances.

8

9 B. Preparation of surfaces.

10 1. Remove protective coatings from surfaces to be glazed.

11 2. Clean glass and glazing surfaces to remove dust, oil and contaminants.

12

13 3.03 INSTALLATION

14

15 A. Install glass in accordance with glass manufacturer's recommended instructions.

16

17 3.04 CLEANING

18

19 A. Remove excess glazing compound from installed glass.

20

21 B. Remove labels from glass surface as soon as installed.

22

23 C. Wash and polish both faces of glass.

24

25 D. Remove debris from work site.

26

27 3.05 PROTECTION

28

29 A. Attach crossed streamers away from glass face.

30

31 B. Do not apply markers to glass surface.

32

33 C. Replace damaged glass.

34

35

36

END OF SECTION 08 80 00

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SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Metal Studs.
- B. Gypsum Board.
- C. Trim and Accessories.
- D. Acoustical Batt Insulation.

1.03 RELATED WORK

- A. Section 09 90 00 Painting.

1.04 REFERENCES

- A. Referenced Specifications: The more stringent requirement of this section or referenced specification applies.
 - 1. "Using Gypsum Board for Walls and Ceilings", The Gypsum Association - GA-201-85.
 - 2. "Recommended Specifications for the Application and Finishing Gypsum Boards", The Gypsum Association - GA-216.

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract.
 - 1. Manufacturer's product data.
 - 2. Texture finish sample.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site with manufacturer's labels intact and legible.
- B. Handle materials with care to prevent damage.
- C. Deliver fire-rated material bearing testing agency label and required fire classification numbers.
- D. Storage
 - 1. Store materials inside under cover, stack flat, off floor.
 - 2. Stack wallboard so that long lengths are not over short lengths.
 - 3. Avoid overloading floor system.
 - 4. Store adhesives in dry area, provide protection against freezing at all times.

1.07 PROJECT CONDITIONS

- 1
2 A. During cold weather, maintain temperature range between 55 degrees F. to 70 degrees F. for 24 hours before,
3 during, and after gypsum board and joint treatment applications.
4
5 B. Ventilation
6 1. Provide ventilation during and following adhesive and joint treatment applications.
7 2. Use temporary air circulators in enclosed areas lacking natural ventilation.
8 3. Protect installed materials from drafts during hot, dry weather.
9

10 PART 2 - PRODUCTS

11
12 2.01 MANUFACTURERS

- 13
14 A. Georgia Pacific.
15
16 B. LaFarge.
17
18 C. National Gypsum Company, Gold Bond.
19
20 D. United States Gypsum Company.
21
22 E. BPB America, Inc.
23
24 F. Chicago Metallic.
25
26 G. Dietrich Industries.
27
28 H. Or approved equal.
29

30 2.02 MATERIALS

- 31
32 A. Gypsum Board: ASTM C 36, long edges tapered; in lengths as long as practical to keep number of end joints
33 to absolute minimum.
34 1. Regular Gypsum Board.
35 2. Water Resistant Wallboard: 5/8-inch thick.
36 3. Cementitious Backer Board: Aggregated, Portland cement board with woven, glass fiber, mesh facing;
37 complying with ANSI A118.9.
38 a. Manufacturer: USG, Durock Interior Tile Backer Board or approved equal.
39 b. Thickness: 1/2 inch.
40 4. Veneer Plaster Base: USG Imperial Gypsum Base, 5/8-inch thick.
41 5. Fire Rated 1 Inch thick gypsum wall board panels, supplied in nominal 24 inch widths type SLX.
42 6. Fire Rated Face Layer: 5/8 inch Gypsum Board:
43 a. American Gypsum; Types AGX-1, AG-C
44 b. Certaineed Gypsum; ProRoc Type C
45 c. Georgia Pacific Gypsum; Type S
46 d. USG; Type C, FRX-G, IP-X2, IPC-AR, SCX, or WRC.
47 e. Or approved equal.
48
49 B. Accessories
50 1. Metal Trim: USG No. 200-A.
51 2. L-shaped Metal Trim for Veneer Plaster: USG No. 801-B.
52 3. Metal Reveal Molding: Fry Reglet DRM-625-75.
53 4. Metal 'Z' Reveal Molding, 1/4" wide: Fry Reglet DRMZ-625-25.

5. Metal 'Z' Reveal Molding, 1" wide: Fry Reglet DRMZ-100-100.
6. Expansion Joints: USG No. 093.
7. Drywall Screws for Metal Framing: 1" Type S-12 or Type S bugle head.
8. Outside Corner Reinforcement: USG No. 104, 1-1/8" x 1-1/8" corner bead.
9. Acoustical Sealant: Equal to Tremco "Tremflex 834" or Pecora "Acoustic and Insulation Sealant", low VOC formulation.
 - a. VOC content less than 50 g/l.
10. Tie Wire: No. 18 SWG, steel wire.
11. Steel runner channel brackets: 25 MSG galvanized steel.
12. Corner angles: 25 MSG galvanized steel.
13. Sound Attenuation Blanket: U.S. Gypsum Thermafiber, or approved equal, 3" for an STC of 49.

C. Metal Studs/Resilient Furring Channels.

1. Unless indicated otherwise, use 25-gage for partitions up to 12'-0" high, use 20-gage for partitions over 12'-0" high.
2. Unless indicated otherwise, use 20-gage studs at door jambs, head.
3. Track gauge shall be same gauge as nested studs.
4. 2 1/2 inch wide by 1 1/2 inches deep C-H studs 24 inch on center. Fabricated from minimum 25 MSG galvanized steel.

D. Suspension System

1. Chicago Metallic 640 system
 - a. Hanger Wire: 8-gage, annealed.
 - b. Carrying Channels: 1-1/2 inch cold rolled steel.
 - c. Screws: USG 1-inch type S.
 - d. Furring Channels: USG metal furring channel, attached with USG furring channel clips.
2. Chicago Metallic 650 System complying with UL Design No. D502.
 - a. Hanger clips: 18 gauge galvanized steel.
 - b. Hanger wire: No. 12 SWG galvanized steel.
 - c. Carrying Channels: 16 gauge 1 1/2 inch cold rolled.
 - d. Furring Cross Channel: 16 gauge 7/8 inch where required.
 - e. Wall Molding: 26 gauge steel channel 1 11/16 inch deep with 15/16 inch flanges.
3. Or approved equal.

E. Drywall Finishing Accessories

1. Joint Compounds: Ready mixed type.
2. Joint Reinforcement: USG Perf-A-Tape or approved equivalent.

F. Texture Finish Materials

1. Ceilings: USG Spray Fine Sand Texture Finish or approved equal.
 - a. Match existing adjacent plaster or drywall finish.
2. Walls (Painted Only): USG Spray Fine Sand Texture Finish, or approved equal.
 - a. Match existing adjacent drywall finish.

PART 3 - EXECUTION

3.01 GYPSUM BOARD

- A. Follow Gypsum Association's recommendations for installation procedures.
- B. Cut wallboards by scoring and breaking or sawing; scribe neatly at wall projections.
- C. Apply first to ceilings then to walls.

- 1
2 D. Locate wallboard joints at openings so that no end joint aligns with edge of opening.
3
4 E. Set fasteners with heads slightly below surface of wallboard. Avoid breaking face paper.
5
6 F. Provide water resistant wallboard at rooms/areas with high humidity.
7

8 3.02 METAL STUDS
9

- 10 A. Attach metal runners at floor and at ceiling or structural elements above with suitable fasteners located 2
11 inches from each end, spaced 16 inches on center.
12
13 B. Position studs vertically, engaging floor and ceiling runners. Splice studs with 8-inch nested lap, one positive
14 attachment per stud flange. Place studs in direct contact with all door frame jambs, abutting partitions,
15 partition corners, existing construction elements.
16
17 C. Provide double studs at jambs and head of each door frame. Securely anchor studs to jamb and head anchor
18 clips at metal door frames by bolt or screw attachment. Over metal frames, place a cut-to-length section of
19 runner horizontally with web-flange bent at each end; secure with one positive attachment per flange.
20 Position a cut-to length stud (extend to ceiling runner) at vertical board joints over door frame header. Place
21 an additional track-to-track stud 6 inches from double jamb studs on both sides of framed openings.
22
23 D. At curved surfaces, space studs and framing members 8 inches on center maximum.
24

25 3.03 CEILING SUSPENSION SYSTEM
26

- 27 A. Suspend carrying channels with 8-gage hanger wires spaced 48 inches on center, within 6 inches of ends.
28
29 B. Install carrying channels 48 inches on center and within 6 inches of walls. Provide 1 inch clearance between
30 channel ends and abutting walls, partitions.
31
32 C. At splices, interlock flanges, overlap ends 12 inches, and secure with 16-gage double standard tie wire at each
33 end.
34
35 D. Erect furring channels at right angles to carrying channels, spaced 24 inches on center and within 6 inches of
36 walls. Provide 1-inch clearance between channel ends and abutting walls, partitions.
37
38 E. Secure to carrying channels with clips, or, saddle tie with 16-gage double standard tie wire. At splices nest
39 channels at least 8 inches, securely wire tie at each end.
40
41 F. Install additional cross reinforcing to restore lateral stability of suspension system at openings that interrupt
42 carrying or furring channels.
43
44 G. Apply wallboard of maximum practical length with long dimension at right angles to furring channels.
45 Position and stagger end joints over channel web. Fit ends and edges closely, but not forced together.
46
47 H. Fasten board to channels with 1-inch Type S screws spaced 12 inches on center in field of board, along
48 abutting ends, edges.
49

50 3.04 EXPANSION JOINTS
51

- 52 A. At Ceilings: 50'-0" on center each way maximum.
53

1 B. At Walls: 30'-0" on center maximum.

2
3 C. Provide at intersections with exposed masonry construction.

4
5 3.05 SINGLE LAYER/ERECTION

6
7 A. Position all ends, edges over framing members, except when edge joints are at right angles to framing
8 members, or when end joints are back-blocked. Apply wallboard horizontally or vertically on walls to
9 minimize the number of joints.

10
11 B. Attach wallboard to metal framing supports by power driven screws. For vertical application space screws 12
12 inches on center in field of board, 8 inches on center staggered along vertical abutting edges. For horizontal
13 application space screws 12 inches on center in field, along abutting end joints.

14
15 3.06 MULTI-LAYER WALLBOARD ERECTION

16
17 A. Base Layer: Erected as specified for "Single Layer Erection".

18
19 B. Joints in face layer to fall at least 10 inches from parallel joints in base layer.

20
21 C. Apply face layers with adhesive in accordance with wallboard manufacturer's printed instructions. Provide
22 sufficient number and spacing of fasteners to hold top layer tight with bottom layer until adhesive dries.

23
24 3.07 JOINT TREATMENT APPLICATION

25
26 A. Mix joint compound in accordance with manufacturer's recommendations.

27
28 B. Apply compound in thin uniform layer to all joints, angles to be reinforced. Apply reinforcing tape centered
29 over joint, seated into compound. Follow immediately with thin skim coat or embed tape. Fold and embed
30 tape in interior angles to provide true angle.

31
32 C. When embedding coat is thoroughly dry, apply second coat of compound, filling board taper flush with
33 surface. Cover tape, feather out slightly beyond tape.

34
35 D. On joints with no taper, cover tape, feather out at least 4 inches on either side of tape.

36
37 E. No second coat is required on interior angles.

38
39 F. When second coat is thoroughly dry, spread finish coat evenly over and extend slightly beyond second coat.
40 Feather to a smooth, uniform finish.

41
42 G. Over taped edges, do not allow finish coat to protrude beyond plane of surface. Apply finish coat to cover
43 tape, taping compound at taped angles to provide true angle. When necessary, sand between coats and follow
44 with final coat to provide smooth surface ready for decoration.

45
46 H. Do not abrade adjacent face-paper surfaces.

47
48 I. Gypsum substrate where located behind dry erase wallcoverings must meet level 4 requirements: All joints
49 and interior angles have tape embedded in joint compound and two separate coats of joint compound applied
50 over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and
51 accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth
52 and free from tool marks and ridges.

- 1 3.08 FINISHING FASTENERS
2
3 A. Apply compound to fastener depressions. Follow with minimum of two additional coats leaving depressions
4 level with surface.
5
6 B. Do not abrade adjacent face-paper surfaces.
7
8 3.09 FINISHING BEAD AND TRIM
9
10 A. Apply first coat to beads, trim. Properly feather out from ground to plane of surface. Embed flanges of
11 corner reinforcement with compound.
12
13 B. When embedding coat is thoroughly dry, apply second coat in same manner as first-coat, extending
14 compound slightly beyond onto face of board.
15
16 C. When second coat is thoroughly dry, apply finish coat extending compound slightly beyond second coat,
17 properly feathering from ground to plane of surface.
18
19 D. Do not abrade adjacent face-paper surfaces.
20
21 3.010 ACOUSTIC SEALANT
22
23 A. Apply sealant at intersections of wallboard and adjacent materials to form a complete seal to air and noise.
24
25 3.011 TEXTURE FINISH
26
27 A. Apply texture finish in accord with manufacturer's printed instructions.
28
29 B. Provide uniform texture over entire surface.
30
31 3.012 ADJUST AND CLEAN
32
33 A. Ridging
34 1. Sand ridges to reinforcing tape without cutting through tape.
35 2. Fill concave areas on both sides of ridge with topping compound.
36 3. After fill is dry, blend in topping compound over repaired area.
37
38 B. Fill cracks with compound and finish smooth and flush.
39
40

END OF SECTION 09 29 00

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Acoustical Board.
- B. Suspension Systems.

1.03 RELATED WORK

- A. Fire Suppression: Division 21.
- B. Heating, Ventilating and Air Conditioning: Division 23.
- C. Electrical: Division 26.

1.04 SUBMITTALS

- A. Submit in accord with General Conditions of Contract.
 - 1. Manufacturer's product specifications and installation instructions for each acoustical ceiling material and suspension system required, including certified laboratory test reports.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size and thickness as applicable, legible and intact.
- B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
- C. Store cartons open at each end to stabilize moisture content and temperature.

1.06 PROJECT CONDITIONS

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof. Complete installation of damp materials before beginning work.
- B. Maintain humidity of 65 - 75 percent in areas where acoustical materials are to be installed 24 hours before, during, and after installation.
- C. Maintain a uniform temperature in the range of 55 to 70 degrees F. prior to and during installation of materials.

1.07 EXTRA MATERIALS

- 1 A. In accord with General Conditions of Contract, deliver extra materials equal to a minimum of 50 square feet of
2 each type of acoustical material supplied.
3
4 B. All cartons shall be new, unopened, packaged with protective covering for storage, and identified with
5 appropriate labels.
6

7 PART 2 - PRODUCTS

8
9 2.01 BOARD TYPE 1

- 10
11 A. Lightly textured nodular lay-in panels, 3/4" thick x 2' x 2', Reveal edge (tegular), White. UL Classified Noise
12 Reduction Coefficient (NRC) .60, Ceiling Attenuation Class (CAC) 35, Light Reflection Coefficient .82,
13 "BioShield", 15 year warranty against sag, 82% recycled content.
14
15 B. Celotex Brand, "Cashmere".
16
17 C. Or approved equal by Armstrong World Industries, Ecophon Certainteed, or USG.
18

19 2.03 INTERMEDIATE DUTY SUSPENSION SYSTEM TYPE 1

- 20
21 A. Armstrong, "Prelude ML, 15/16" Exposed Tee".
22 1. Material: Hot-dipped, galvanized steel.
23 2. Surface Finish: Baked polyester paint.
24
25 B. Or approved equal by Chicago Metallic, National Rolling Mills, Donn/USG.
26
27 E. Conform to all requirements of ASTM C-635 intermediate structural classification.
28
29 F. Provide flat white finish, 15/16" face.
30

31 PART 3 - EXECUTION

32
33 3.01 EXAMINATION

- 34
35 A. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness,
36 irregularities, and dampness that would affect quality and execution of work. Do not proceed with work until
37 unsatisfactory conditions have been corrected.
38

39 3.02 INSTALLATION

- 40
41 A. Do not begin installation until sufficient materials to complete a room are received.
42
43 B. Install materials in accordance with manufacturer's printed instructions, governing regulations, fire resistance
44 rating requirements, and industry standards applicable to work.
45
46 C. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of
47 each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans
48 wherever possible.
49
50 D. Symmetrically locate grid layout in each space. Coordinate work with other trades so that lighting fixtures,
51 grilles, and other ceiling fixtures work with grid layout.
52

- 1 E. Do not use universal splices or other splices which would obstruct passage of recessed lighting fixtures through
2 grid openings or limit fixture relocation upon flanges of ceiling grids.
3
4 F. Support suspension system from structure above, not from ductwork, metal deck, equipment or piping.
5
6 G. Space hangers not more than 6 inches from ends and not more than 4 feet on center.
7
8 H. Install edge moldings at the perimeter of each acoustical ceiling area and at locations where edge of units would
9 otherwise be exposed.
10 1. Secure moldings to building construction by fastening with screw anchors into the substrate, through holes
11 drilled in vertical leg. Space holes not more than 3 inches from each end and not more than 16 inches on
12 center along each molding.
13 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8 inch in 12 feet.
14 3. Miter corners of moldings accurately to provide hairline joints, securely connected to prevent dislocation.
15 Cope exposed flanges of intersecting suspension system members, so that flange faces will be flush.
16 4. Furnish additional tees for supporting grilles, diffusers and light fixtures. Refer to the reflected ceiling,
17 HVAC and electrical plans for locations.
18 5. Provide tegular edge at walls, other abutting vertical surfaces.
19 6. Field paint cut edges to match surface color and sheen.
20
21 I. Arrange acoustical units and orient directionally-patterned units, if any, in manner shown on reflected ceiling
22 plans.
23

24 3.03 CLEANING

- 25
26 A. Clean exposed surfaces of acoustical ceilings, trim, edge moldings, and suspension members to comply with
27 manufacturer's instructions for cleaning and touch-up of minor finish damage.
28
29 B. Remove work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
30

31 3.04 PROTECTION

- 32
33 A. Provide required protection for the acoustical ceilings, including temperature, humidity limitations and dust
34 control so that the work will be without damage and deterioration at the time of acceptance by the Owner.
35
36

37 END OF SECTION 09 51 00
38
39

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

A. Resilient Base.

1. Contractor to furnish and install rubber base, roll stock.

B. Accessories.

C. Subfloor Preparation.

1.03 RELATED WORK

- A. Selective Structure Demolition: Section 02 41 19.

- B. Carpet (rubber and metal reducers): Section 09 68 00.

1.04 QUALITY ASSURANCE

- A. Provide each type of resilient flooring and accessories from a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

- B. Installers Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.

- C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials.

1. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.

1.05 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract.

1. Manufacturer's technical data for each type of resilient flooring and accessory.

- a. Data indicating adhesive and accessories meet VOC requirements.

2. Manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

3. Submit samples of metal edge strips.

4. Two copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1 1.06 DELIVERY, STORAGE AND HANDLING

- 2
3 A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand
4 names, colors and patterns, and quality designations legible and intact.
5
6 B. Store and protect materials in accordance with manufacturer's recommendations.
7

8 1.07 PROJECT CONDITIONS

- 9
10 A. Maintain minimum temperature of 65 degrees F and maximum temperature of 90 degrees F in spaces to
11 receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48
12 hours after installation. Subsequently, maintain minimum temperature of 55 degrees F in areas where work is
13 completed.
14
15 B. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning
16 installation.
17
18 C. Install resilient flooring and accessories after other finishing operations, including painting, have been
19 completed.
20
21 D. Do not install resilient flooring over concrete slabs until they have been cured and are sufficiently dry to
22 achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and
23 moisture test.
24
25 E. Close areas to traffic and to other work until flooring is firmly set. Tile shall have 72 hours with no traffic.
26
27 F. Where solvent based adhesives are used, provide safety sparkproof fans when natural ventilation is not
28 adequate.
29

30 1.08 EXTRA MATERIALS

- 31
32 A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials
33 installed and enclosed in protective packaging with appropriate identifying labels.
34 1. Furnish one box for each type, color, pattern and size installed.
35

36 PART 2 - PRODUCTS

37
38 2.01 RESILIENT WALL BASE

- 39
40 A. General: Rubber, cove base, top set, roll stock.
41 1. Height: 4". 6" where required to match existing adjacent base.
42 2. Color: To be selected from manufacturers full line to match existing.
43
44 B. Manufacturers: Armstrong (colors to be selected from manufacturers' full range) or approved equal by:
45 1. Flexco.
46 2. Freudenberg Building Systems, Nora.
47 3. Johnsonite.
48 4. Roppe.
49

50 2.02 ACCESSORIES

- 51
52 A. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and
53 substrate conditions; equal to HENRY GreenLine GL33High-Performance VCT Adhesive, low VOC type.

- 1
2 B. Adhesive for Wall Base: W.W. Henry “595 Cove Base Adhesive”, zero-VOCs; W.F. Taylor “2035 Cove
3 Base Adhesive” or “2040 Premium Cove Base Adhesive”, GreenGuard certified; PL Adhesives & Sealants
4 “Cove Base Adhesive”; Bostik Findley, Durabond “D-740 Multipurpose Wall Adhesive”.
5 1. Low-VOC type: VOC content less than 100 g/l.
6
7 C. Concrete Slab Primer: Non-staining, low-VOC type, equal to W.F. Taylor Co. “Envirotec Healthguard”
8 #2006, as approved by flooring and underlayment manufacturers.
9
10 D. Patching, Leveling, Underlayments: The leveling materials must be portland cement based and provide a
11 minimum 3,500 PSI compressive strength (ASTM C 109) and sufficient bond to existing subfloor surface.
12 1. Ardex, Laticrete, Duralox, Mapei, or equivalent, approved by flooring manufacturer.
13
14 E. Metal Edge Strip: Similar to Ceramic Tile Company CTC1132CTA.
15

16 PART 3 - EXECUTION

17
18 3.01 EXAMINATION

- 19
20 A. Examine subfloor surfaces to determine that they are dry, clean, and smooth.
21
22 B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry
23 as well as to ascertain presence of curing compound. Do not use curing compounds on concrete subfloors.
24
25 C. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory. Indicate adverse
26 conditions of any type by letter.
27

28 3.02 PREPARATION

- 29
30 A. Comply with ASTM F 710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring,
31 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient
32 flooring adhesive by method acceptable to manufacturer.
33
34 1. Concrete floors with steel troweled (slick) finish shall be properly roughened (sanded) to ensure
35 suitable adhesion.
36 2. Concrete floors with curing, hardening and/or breaking compounds shall be abraded with mechanical
37 methods only to remove compounds.
38 a. Do not use chemicals for removal.
39 b. Do not use wax or oil based sweeping compounds.
40
41 B. Sand or grind subfloors to remove mortar, paint, other surface irregularities.
42
43 C. Where filling, patching, leveling is required of thickness exceeding 1/8-inch apply latex type underlayment in
44 two or more applications. Apply compound in accordance with manufacturer's printed instructions.
45
46 D. Remove all debris, sand, and other materials which would result in lack of adhesion and/or star cracking.
47

48 3.03 WALL BASE INSTALLATION

- 49
50 A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where
51 base is required.
52

- 1 B. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials
2 with mitered or coped inside corners. Cut no shorter than full wall length.
- 3
- 4 C. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and
5 vertical surfaces.
 - 6 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall
7 base with manufacturer's recommended adhesive filler material.
 - 8 2. Adhesive shall cover a minimum of 90 percent of ribbed back of base.
 - 9 3. Leave 1/4 inch uncovered space at top edge of base to prevent oozing.
 - 10 4. Roll base firmly, roll back toward starting point.
- 11

12 3.04 CLEANING

- 13
- 14 A. Perform following operations immediately upon completion of resilient flooring.
 - 15 1. Sweep or vacuum floor thoroughly.
 - 16 2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to
17 allow resilient flooring to become well-adhered to adhesive.
 - 18 3. Damp-mop floor being careful to remove black marks and excessive soil.
 - 19 4. Remove any excess adhesive or other surfaces blemishes, using appropriate cleaner recommended by
20 resilient flooring manufacturers.
 - 21 5. Provide two coats of wax of type as recommended by flooring manufacturer. Buff to shine for each
22 coat.
- 23

24 3.05 PROTECTION

- 25
- 26 A. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's
27 directions.
- 28
- 29

30 END OF SECTION 09 65 00

SECTION 09 68 00

CARPET

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Standard Commercial Carpet.
- B. Floor Filler.
- C. Adhesives.

1.03 RELATED WORK

- A. Related Sections include the following:
 - 1. Section 02 41 19: "Selective Structure Demolition" for removing existing floor coverings.
 - 2. Section 09 65 00: "Resilient Flooring" for resilient wall base installed with carpet.

1.04 REFERENCES

- A. Carpet shall be in strict accord with Wisconsin Enrolled Commercial Building Code, Chapter 11 - "Accessibility".
- B. Carpet and Rug Institute (CRI).

1.05 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, fade resistance and printed statement of VOC content.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: 12-inch square, (2) Samples.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 6-inch long, (2) Samples.
- C. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.
- D. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

- 1 A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation
2 Board or who can demonstrate compliance with its certification program requirements.
3
- 4 1.07 DELIVERY, STORAGE, AND HANDLING
5
- 6 A. Comply with CRI 104, Section 5, "Storage and Handling."
7
- 8 1.08 PROJECT CONDITIONS
9
- 10 A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12,
11 "Ventilation."
12
- 13 B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and
14 ambient temperature and humidity conditions are maintained at the levels indicated for Project when
15 occupied for its intended use.
16
- 17 C. Floors must be free of dust, oils, grease, or other foreign matter.
18
- 19 D. Allow installation to cure for a minimum of 24 hours before subjecting it to any traffic, moving of
20 furniture, or other heavy equipment.
21
- 22 1.09 WARRANTY
23
- 24 A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or
25 replace components of carpet installation that fail in materials or workmanship within specified warranty
26 period.
27 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of
28 substrate, vandalism, or abuse.
29 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling,
30 snags, runs, and delamination.
31 3. Warranty Period: Lifetime.
32
- 33 1.010 EXTRA MATERIALS
34
- 35 A. Furnish extra materials described below, before installation begins, that match products installed and that
36 are packaged with protective covering for storage and identified with labels describing contents.
37 1. Carpet: Full-sized Tiles equal to 5 percent of amount installed for each type indicated, but not less
38 than 10 sq. yd.
39
- 40 PART 2 - PRODUCTS
41
- 42 2.01 STANDARD COMMERCIAL CARPET TILES
43 A. Products: Subject to compliance with requirements:
44 1. Carpet, CPT-1:
45 a. Carpet Tile
46 b. Manufacturer: Shaw
47 c. Collection: Homage
48 d. Style: Block Print Tile 59572
49 1) Installation Method to be selected by Architect from manufacturer's
50 recommendations.
51 2) Color: to be selected from manufacturer's full line.
52 e. Size: 24"x24"
53 f. Backing: EcorWorx® Tile
54 g. Weight: 24 oz tufted weight

- h. Dye Method: 77% solution dyed/23% Yard Dyed
- i. Fiber: eco solution q nylon
- j. Protective treatment: ssp shaw soil protection
- k. Or approved equal.

2. Carpet, CPT-2:

- a. Same line and style as CPT-1, second color selection from manufacturer's full line.

B. Characteristics: All carpet shall be same mill run throughout.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Pressure sensitive adhesive LokDots for installation over existing VCT in Offices 365 BA – Corridor 365 BJ.

C. Adhesives: Water-resistant, mildew-resistant, non-staining pressure sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

- 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when calculated according to 40CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 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 performance. Examine carpet 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.
 - a. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
- 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.02 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

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 wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

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 manufacturer.

1
2 D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3
4 3.03 INSTALLATION

5
6 A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

- 7 1. Pressure sensitive adhesive LokDots.
8 2. Direct-Glue-Down Installation.

9
10 B. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in
11 closed position.

- 12 1. At door openings install adapters/transitions/reducers to be covered by door when in the closed
13 position.
14 2. Level adjoining border edges.

15
16 C. Do not bridge building expansion joints with carpet.

17
18 D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including
19 cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by
20 carpet manufacturer.

21
22 E. Install metal transition strip with anchoring leg under carpet where carpet abuts ceramic tile. Install
23 rubber transition strip where carpet abuts resilient flooring.

- 24 1. Secure metal transition strip to substrate according to manufacturer's instructions.

25
26 F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges,
27 alcoves, and similar openings.

28
29 G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by
30 repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

31
32 H. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet
33 Installations" and with carpet manufacturer's written recommendations.

34
35 I. All selvages shall be trimmed to ensure good side seams. All seams shall receive an 1/8" continuous bead
36 of seam adhesive at the point the face yarn enters the back.

- 37 1. Fit edges together with an invisible seam and bond with appropriate adhesive.

38
39 3.04 CLEANING AND PROTECTING

40
41 A. Perform the following operations immediately after installing carpet:

- 42 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by
43 carpet manufacturer.
44 2. Remove yarns that protrude from carpet surface.
45 3. Vacuum carpet using commercial machine with face-beater element.

46
47 B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

48
49 C. Protect carpet against damage from construction operations and placement of equipment and fixtures
50 during the remainder of construction period. Use protection methods indicated or recommended in
51 writing by carpet manufacturer and carpet adhesive manufacturer.

52
53
54 END OF SECTION 09 68 00

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Painting and finishing of interior exposed items and surfaces throughout Project.
- B. Refinishing as indicated on Drawings, including removal of paint and finishes, preparation, painting and finishing.
- C. Field painting of exposed bare and covered pipes and ducts and hangers, conduits, uni-strut, exposed steel and iron work and primed metal surfaces including but not limited to, hollow metal work, equipment installed under mechanical and electrical work.
- D. "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied material whether used as prime, intermediate or finish coats.
- E. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.
- F. Following categories are not included as part of field-applied finish work.
 - 1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified.
 - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces in concealed areas and generally inaccessible areas.
 - 3. Finished Metal Surfaces.
 - 4. Operating Parts.

1.03 RELATED WORK

- A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
- B. Examine the Contract Documents and be familiar with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other Sections shall be painted or finished as part of this Section.

1.04 SUBMITTALS

- A. Submit in accordance with General Conditions of Contract:
 - 1. Paint: Submit a list of specified products with corresponding name of manufacturer, identifying name and number of proposed products along with manufacturer's written instructions for use of each product.

- 1 2. If manufacturer to be used is different from that of color chips furnished, prepare and submit
2 two approximately 6 inch square, properly labeled samples of each color and sheen required
3 on properly prepared paint-out cards or hardboard.
4
- 5 3. Prepare and repaint an area of each designated interior surface to requirements specified
6 herein, with specified paint or coating showing selected color, gloss/sheen, texture and
7 workmanship to MPI Repainting Manual standards for review and approval by Owner and
8 A/E. When approved, interior surface shall become acceptable standard of finish quality and
9 workmanship for similar on-site repainting work.
10

11 1.05 QUALITY ASSURANCE
12

- 13 A. Master Painters Institute (MPI) Standards:
14 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products
15 List."
16
17 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting
18 Specification Manual" for products and paint systems indicated.
19 a. For areas to be renovated, comply with requirements in "MPI Maintenance
20 Repainting Manual".
21

22 1.06 DELIVERY, STORAGE AND HANDLING
23

- 24 A. Do not deliver materials to site until having received all written approvals of submitted information
25 and samples.
26
27 B. Deliver materials to job site in original, new and unopened packages and containers bearing
28 manufacturer's name and label.
29
30 C. Store materials not in actual use in tightly covered containers.
31
32 D. Take all precautions to ensure that workers and work areas are adequately protected from fire
33 hazards and health hazards resulting from handling, mixing and application of paints.
34
35 E. Remove rags and waste from storage areas daily.
36

37 1.07 PROJECT CONDITIONS
38

- 39 A. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air
40 temperatures are between 50 and 95 degrees F.
41
42 B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air
43 temperatures are between 45 degrees F. and 95 degrees F.
44
45 C. Do not apply paint when relative humidity exceeds 85%; at temperatures less than 5 degrees F.
46 above the dew point; or to damp or wet surfaces.
47

48 1.08 SEQUENCING AND SCHEDULING
49

- 50 A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto
51 newly-painted surfaces.
52

53 1.09 EXTRA MATERIALS
54

- 55 A. Furnish extra materials described below that are from same production run (batch mix) as materials
56 applied and that are packaged for storage and identified with labels describing contents.

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55

- 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.010 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-site must meet the limitations and restrictions concerning chemical components set by the following standards:
 - 1. Topcoat Paints, Green Seal Standard GS-11, Paints: First Edition, May 20, 1993.
 - 2. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints", Second Edition, January 7, 1997. For applications on ferrous metal substrates.
 - 3. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on January 1, 2004.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Sherwin Williams Company.

2.02 MATERIALS

- A. Use the materials of the same manufacturer for each system.
- B. Sherwin Williams systems are called out in the system schedules to establish quality and dry mil thickness of finished installation for all systems. A different manufacturer may be used for color selection. Any manufacturer noted above may be used as long as quality and color requirements are met.
 - 1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- C. Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers.
- D. Material Compatibility:
 - 1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- E. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
 - 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
 - 2. Non-flat Paints and Coatings: VOC content of not more than 150 g/L.

- 1 3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by
2 weight of total aromatic compounds (hydrocarbon compounds containing one or more
3 benzene rings).
4 4. Restricted Components: Paints and coatings shall not contain any of the following:
5
6 a. Acrolein.
7 b. Acrylonitrile.
8 c. Antimony.
9 d. Benzene.
10 e. Butyl benzyl phthalate.
11 f. Cadmium.
12 g. Di (2-ethylhexyl) phthalate.
13 h. Di-n-butyl phthalate.
14 i. Di-n-octyl phthalate.
15 j. 1,2-dichlorobenzene.
16 k. Diethyl phthalate.
17 l. Dimethyl phthalate.
18 m. Ethylbenzene.
19 n. Formaldehyde.
20 o. Hexavalent chromium.
21 p. Isophorone.
22 q. Lead.
23 r. Mercury.
24 s. Methyl ethyl ketone.
25 t. Methyl isobutyl ketone.
26 u. Methylene chloride.
27 v. Naphthalene.
28 w. Toluene (methylbenzene).
29 x. 1,1,1-trichloroethane.
30 y. Vinyl chloride.

31
32 F. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
33

34 2.03 PRIMERS/SEALERS

35
36 A. Interior Latex Primer/Sealer: MPI #50.
37

38 2.04 METAL PRIMERS

39
40 A. Rust-Inhibitive Primer (Water Based): MPI #107.
41

42 2.05 LATEX PAINTS

43
44 A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).
45

46 B. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
47

48 C. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
49

50 D. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
51

52 2.06 EQUIPMENT

53
54 A. Provide all brushes, rollers, ladders, scaffolding, and other equipment of any kind to properly
55 execute each type of work.
56

1 PART 3 - EXECUTION

2

3 3.01 EXAMINATION

4

5 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for
6 maximum moisture content and other conditions affecting performance of work.

7

8 B. Maximum Moisture Content of Substrates:

- 9 1. Gypsum Board: 12 percent.
- 10 2. Concrete: Must be cured a minimum of 45 days.

11

12 C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes
13 and primers.

14

15 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are
16 dry.

- 17 1. Beginning coating application constitutes Contractor's acceptance of substrates and
18 conditions.

19

20 3.02 PREPARATION

21

22 A. Perform preparation and cleaning procedures in accord with paint manufacturer's instructions and as
23 specified for each particular substrate condition.

- 24 1. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and
25 similar items in place and not to be finish-painted, or provide surface-applied protection prior
26 to surface preparation and painting operations.

27 a. After completing painting operations, use workers skilled in the trades involved to
28 reinstall items that were removed. Remove surface-applied protection if any.

29 b. Do not paint over labels of independent testing agencies or equipment name,
30 identification, performance rating, or nomenclature plates.

31

32 2. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and
33 grease prior to mechanical cleaning.

34 3. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental to
35 formation of a durable paint film.

36

37 B. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level surfaces
38 taking care not to raise nap of paper.

39

40 C. Existing Ferrous Metal

41

42 1. Spot remove failed, damaged or rough existing paint to bare metal by means of stripping as
43 indicated above. If existing metal surface is not smooth, sand or wire brush.

44 a. Sand edges of existing paint to a feather edge.

45 2. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer
46 and clean cloths.

47

48 D. Ferrous Metal

49

50 1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer
51 and clean cloths.

52 2. Where not galvanized, shop coat of primer will exist on surface. If prime coat is not smooth,
53 sand to bare metal and re-prime.

54

55 3.03 APPLICATION

56

- 1 A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse
2 humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
3
4 B. Do work under adequate illumination and dust-free conditions.
5
6 C. Apply paints according to manufacturer's written instructions.
7 1. Use applicators and techniques suited for paint and substrate indicated.
8 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
9 Before final installation, paint surfaces behind permanently fixed equipment or furniture with
10 prime coat only.
11 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged
12 items to match exposed surfaces.
13
14 D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same
15 material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient
16 difference in shade of undercoats to distinguish each separate coat.
17
18 E. Materials
19 1. Do not open containers until required for use.
20 2. Stir materials thoroughly and keep at uniform consistency during application.
21
22 F. Coats
23 1. Number specified is minimum.
24 2. Touch up suction spots between coats.
25 3. If undercoats or other conditions show through topcoat, apply additional coats until cured
26 film has a uniform paint finish, color, and appearance.
27 4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush
28 marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines
29 and color breaks.
30 5. Refinish surfaces affected by refitting work.

31
32 3.04 COLOR SEPARATION
33

- 34 A. An average of one or two wall colors will be used per room. Ceilings generally will be a different
35 color than walls. Finished closets will usually be same as adjoining rooms.
36
37 B. Job painted metal items such as diffusers, grilles and registers will generally be same color as
38 adjacent surface.
39
40 C. Hardwood generally will be the same color stain throughout.
41

42 3.05 CLEANING
43

- 44 A. During the progress of this work, remove from the site all discarded paint materials, rubbish, cans
45 and rags at the end of each work day.
46
47 B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove
48 spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise
49 damage finished surfaces.
50

51 3.06 PROTECTION
52

- 53 A. Protect work of other trades, whether to be painted or not, against damage by painting and finishing
54 work. Correct damage by cleaning, repairing or replacing.
55

1 B. Provide "wet paint" signs to protect newly-painted finishes. Remove temporary protective
 2 wrappings, after completion of painting operations.

3
 4 C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted
 5 surfaces.

6
 7 3.07 SCHEDULE OF INTERIOR WORK

- 8
 9 A. In addition to obvious surfaces, the following do not require painting or finishing.
 10 1. Do not include painting when factory-finishing or installer-finishing is specified for such
 11 items as (but not limited to) acoustic materials, finished mechanical and electrical equipment
 12 including light fixtures and distribution cabinets.
 13 2. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally
 14 inaccessible areas, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 15 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and
 16 similar finished materials will not require finish painting, unless otherwise indicated.
 17 4. Moving parts of operating units, mechanical and electrical parts, such as valve and damper
 18 operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish
 19 painting, unless otherwise indicated.
 20 5. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory
 21 Mutual, or any equipment identification, performance rating, name or nomenclature plate.
 22 6. N/A indicates system not applicable to this Project.

- 23
 24 B. Walls and Ceilings
 25 1. Paint all rooms. Paint patched walls from 90 degree corner and patched ceilings complete.
 26 2. Do not apply next coat until previous is thoroughly dry.
 27 3. Provide final coat which is solid and even in color, free from runs, laps, sags, brush marks,
 28 air bubbles and excessive roller stipple and worked into crevices, joints and similar areas.

- 29
 30 C. Electrical Panel Box Covers and Doors
 31 1. Remove, paint and reinstall after paint is dry.

- 32
 33 D. Other Unfinished and Primed Surfaces
 34
 35 1. Provide specified finish on exposed surfaces. This includes prime coated mechanical units,
 36 piping, pipe covering, conduit, and interior duct surfaces visible behind grilles.

37
 38 E. Material Type Number and Type of Coating

System	Material	Type/Sheen	Number and Type of Coating
IPS-1	Wood	Water-based Stain, Transparent/Satin	One coat "Wood Classics 250"; Two coats "Target Coatings 9000 Series 'Clear Coat' Polyurethane Ultra-Low VOC"; Custom colors to match A/E's finish control sample
IPS-6	Gypsum Board	Epoxy-Gloss	One coat "ProMar Primer" Two coats "Water based Catalyzed Epoxy"
IPS-7	Gypsum Board	Latex-Eggshell Zero VOC	One coat "Harmony Interior Latex Primer", Two coats "Harmony Interior Latex Eggshell".
IPS-13	Ferrous Metal (Unprimed)	Latex/Semi-gloss	One coat "Pro-Cryl Universal Primer"; Two coats "ProClassic Waterborne"
IPS-14	Ferrous Metal (Primed)	Latex/Semi-gloss	One coat "Pro-Cryl Universal Primer"; Two coats "ProClassic Waterborne"
IPS-15	Copper/Aluminum (finished rooms only)	Latex/Flat	One coat "DTM Acrylic Primer; Finish"; Two coats "ProMar 200 Interior Latex Flat"
IPS-16	Galvanized Metal (finished rooms only)	Latex/Flat	One coat "DTM Acrylic Primer Finish"; Two coats "ProMar 200 Interior Latex Flat"

1 F. Color Schedule

- 2
3 PT-1: GWB Ceiling, typ. color to be selected
4 PT-2: Field color to be selected
5 PT-3: Accent color to be selected
6 HM Frames color to be selected
7 PT-6: Accent color to be selected
8 PT-7: Accent color to be selected
9

10 For reference, selected colors will likely require match of existing. Existing color schedule:

- 11 Field Sherwin-Williams 6385 Dover White
12 Field Benjamin Moore HC-31 Waterbury Cream
13 Accent Benjamin Moore 1634 Santorini Blue
14 Accent Benjamin Moore 986 Smoky Ash
15 HM Frames: Sherwin Williams 7069 Iron Ore or to match wall color
16 Conference: Sherwin Williams 7050 Useful Gray and 7055 Enduring Bronze
17

18
19 Confirm all color selections and locations with Architect & Owner prior to submitting draw downs.
20
21
22

23 END OF SECTION 09 90 00

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Manually operated sunscreen roller shades on all exterior windows within the project scope.

1.03 RELATED WORK

- A. Rough Carpentry, Section 06 10 00: blocking for support of window shade brackets.
- B. Substrate for window shade systems and installation of accessories supplied only under this section.

1.04 QUALITY ASSURANCE

- A. Manufacturer shall have 15 years experience in the manufacture of products comparable with those specified in this section.
- B. Manufacturer shall provide all shading components and electrical components for a complete installation and a single source of shading and lighting control where applicable.
- C. The manufacturer or licensed agent shall be approved to provide the products specified, honor all claims against the product in accordance with the warranty.
- D. Manufacturer shall provide 24/7 technical support to aid in troubleshooting system wiring and assist in system programming.
- E. Installer shall be qualified for installation by experience and be approved by the manufacturer.

1.05 SUBMITTALS

- A. Submit manufacturer's descriptive literature for each product type specified. Details shall indicate materials, finishes, construction, and mounting requirements. Also include installation and operating instructions.

1.06 SHOP DRAWINGS

- A. Indicate Head, jamb, and sill details to aid General Contractor to coordinate work as well as relevant dimensions and mounting requirements for each product type and mounting condition.
- B. Provide shade schedule coordinating room number, opening size(s), quantities and key to details.
- C. Submit a proposed seaming diagram for Architect approval at any openings where seams are required. Utilize manufacturer's maximum fabric dimension to minimize seams.

1.07 SAMPLES

- 1 A. Portfolio of shade fabric swatches for initial fabric color selection from manufacturer's full range of
- 2 available fabrics. Provide sample and profiles of all aluminum fascias for selection from
- 3 manufacturer's full range of available fascias.
- 4
- 5 B. Material samples for color and finish selection of controls.
- 6
- 7 C. One fully operational window shade sample of each type required complete with selected shade fabric
- 8 including sample of seam/batten when applicable. Location of sample to be determined by Architect.
- 9
- 10 D. One complete set of all shade components demonstrating compliance.

11
12 1.08 CERTIFICATION

- 13
- 14 A. Test Reports indicating compliance with Fabric test properties listed in Part 2.
- 15

16 1.09 MANUFACTURER'S INSTRUCTION

- 17
- 18 A. Installation, Programming, and Maintenance instructions to be included in product packaging.
- 19
- 20 B. 24-Hour / 7-Day Technical support shall be available to aid with unforeseen installation difficulties.

21 1.10 DELIVERY, STORAGE, AND HANDLING

22 A. Storage and Protection

- 23 1. Do not deliver items to the project until all concrete, masonry, plaster, painting and other wet
- 24 work has been completed and is dry.
- 25 2. Deliver shades to project in protective packaging, uniquely labeled to identify each shade for each
- 26 opening. Schedule delivery to prevent delays to completion of work, but to minimize on-site
- 27 storage time.
- 28 3. Store materials in a dry, secure place. Protect from weather, surface contaminants, corrosion,
- 29 construction traffic, and all other potential damage.

30 B. PROJECT / SITE CONDITIONS

- 31 1. Shade system shall not be installed until the building is operating in ambient temperature and
- 32 humidity ranges consistent with that intended for buildings ultimate use.

33 C. SCHEDULING

- 34 1. Do not fabricate shades without obtaining field dimensions for each opening.
- 35 2. Coordinate construction of surrounding conditions to allow for timely field dimension verification.
- 36 3. Manufacturer's standard lead times apply. Reference submittal and schedule accordingly for
- 37 project timeline.

38 D. EXTRA MATERIALS

- 39 1. The manufacturer shall make available to the end user a method of ordering new equipment for
- 40 expansions, replacement, or parts to be used as spares twenty-four hours a day, seven days a week.
- 41 2. The manufacturer must make available new or remanufactured parts for a minimum period of ten
- 42 years from the final date of commissioning.

43 PART 2 - PRODUCTS

44 2.01 MANUFACTURERS

- 45 A. To establish the standard of quality, design, and function desired, drawings and specifications are

- 1 based on the Manual Solar Shades by:
- 2 1. Springs Window Fashions, SWFcontract.
- 3 2. Or approved equal by MechoShade Systems, Inc., Hunter Douglas, or approved equal.
- 4 3. Dealer contact information: Interiors by J&L, Janice Quinton, 608.592.4221 or other approved
- 5 dealer.

6 2.02 GENERAL SYSTEM SPECIFICATIONS

7 A. OPERATION

- 8 1. Manual.

9 2.03 ROLLER SHADES

10 A. MOUNTING

- 11 1. Roller shade brackets shall allow for symmetrical light gaps as small as 3/4" on each side of
- 12 shade.
- 13 2. System shall have a roller shade leveling adjustment that allows level adjustment while the
- 14 roller shades are mounted to the brackets.
- 15 3. System shall allow a side-to-side adjustment of up to ±3/8" on each side while the shade is
- 16 mounted to the bracket to properly center shade over the window.
- 17 4. System shall have a projection adjustment of up to 1/2" allowing the shade to clear the trim or
- 18 move the shade closer to the window in order to have a tighter seal between the fabric and the
- 19 window.
- 20 5. System dual brackets shall be provided to permit two shades rollers to be mounted in the same
- 21 opening .

22 B. SHADE TUBE

- 23 1. 2.5" aluminium extrusion
- 24 2. Fabric shall be connected to the tube with double-sided adhesive strip applied for exact and firm
- 25 mounting of the fabric and for easy adjustment of fabric to prevent telescoping.
- 26 3. A minimum of one turn of fabric will be placed on the roller before the working section of
- 27 fabric starts, to protect the fabric and smooth out the starting seam.

28 C. FABRICS

- 29 1. Qualifications
- 30 a. Fire – Provide shade fabrics tested in accordance with:
- 31 i. 1989 NFPA 701 small scale Vertical Burn Test and rated "PASS."
- 32 ii. 1996 NFPA 701 small scale Vertical Burn (telephone booth test) and rated "PASS."

33 E. MANUFACTURING

- 34 1. Where applicable, shade fabric will be ultrasonically cut and friction sealed to minimize fraying.
- 35 2. Woven yarn fabrics will be interlocking and heat-treated so that all material is securely bonded.
- 36 3. Shade Fabric panels shall be 100% visually inspected for defects using a light box integrated
- 37 into the manufacturing line.
- 38 4. 100% visual inspections shall be performed on each shade seam and hem bar welds and
- 39 compared to strict aesthetic standards.

- 1 5. Shade seam weld strength process shall be tested on a daily basis to ensure controlled
- 2 consistency of weld quality.
- 3 6. Shade panels shall be 100% checked for squareness ($\pm 1/16''$)
- 4 7. Shade panels shall be 100% visually inspected to ensure there are no frayed edges or defects in
- 5 the cut.

6 F. LIGHT FILTERING FABRICS

- 7 1. Equal to Phifer Shearweave 2410, Greenguard Certified.
- 8 a. Openness factor to be selected by architect from manufacturer's full range.
- 9 b. Beige/Pearl Gray. Color to be selected by architect from manufacturer's full range.

10 G. BLACKOUT FABRIC

- 11 1. Where indicated in schedule.

13 H. FASCIA

- 14 1. To be selected from manufacturer's full range.

16 I. HEM BAR

- 17 1. Standard Sealed Hem Bar shall be a 1" wide by .1875" thick extruded aluminum bar enclosed on
- 18 all sides in a thermally sealed pocket across the bottom of the shading fabric.

19
20 PART 3 - EXECUTION

21 3.01 EXAMINATION

- 22 A. Refuse delivery of any damaged packaging.
- 23 B. Ensure all parts match specified bill of materials and purchase order.

24 3.02 INSTALLATION

- 25 A. Install shades in windows level and plumb to provide smooth operation.
- 26 B. Install in accordance with manufacturer's product data and approved shop drawings
- 27 C. Field measurement and installation shall be performed by a factory-trained technician.

28 3.03 FIELD QUALITY CONTROL

- 29 A. Site test/Inspection
- 30 1. Examine substrate and conditions for installation. Do not commence installation until conditions
- 31 are satisfactory. Commencement of installation indicates acceptance of site conditions by
- 32 Contractor. Notify the Design Professional upon inspection when the project conditions are
- 33 unacceptable for shade installation. "Beginning of installation" means acceptance of substrate and
- 34 project conditions.

35 3.04 ADJUSTING

- 36 A. Adjust fabric on tube to prevent telescoping of fabric over time.

37 3.05 CLEANING

- 38 A. Touch up damaged finishes and repair minor damage in order to eliminate evidence of repair. Remove
- 39 and replace work that cannot be satisfactorily repaired.

1 1. Clean exposed surfaces, including metal and shade fabric, using non-abrasive materials and
2 methods recommended by the Shade Fabric Manufacturer. Remove and replace work that cannot
3 be satisfactorily cleaned.

4 3.06 DEMONSTRATION

5 A. Demonstrate operation method and instruct Owner's personnel in the proper operation and maintenance of
6 the window shade systems.

7 3.07 SCHEDULE OF OPENINGS

8 A. All Exterior Openings: Offices 365 BA, 365 BB, 365 BD, 365 BF, 365 BG, 365 BH, 365 BI.
9 Field verify existing openings, typical approximate rough opening is 6'-2" high.

10

11

END OF SECTION 12 24 13

12

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SECTION 21 05 00

BASIC FIRE SUPPRESSION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe, fittings, valves, and connections for sprinkler systems.

B. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Division 09 – Finishes

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
2. ASME B16.11 - Forged Steel Fittings - Socket-Welding and Threaded.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B16.25 - Buttwelding Ends.
6. ASME B16.3 - Malleable Iron Threaded Fittings.
7. ASME B16.4 - Gray Iron Threaded Fittings.
8. ASME B16.5 - Pipe Flanges and Flanged Fittings.
9. ASME B16.9 - Factory-Made Wrought Steel Buttwelding Fittings.
10. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.

B. American International (ASTM):

1. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
4. ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
5. ASTM A795 - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
6. ASTM B247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
7. ASTM B32 - Standard Specification for Solder Metal.
8. ASTM B75 - Standard Specification for Seamless Copper Tube.
9. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
10. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
11. ASTM D3309 - Standard Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems.
12. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
13. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
14. ASTM F442 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
15. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

- 1 C. American Welding Society (AWS):
2 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
3 2. AWS D1.1 - Structural Welding Code - Steel.
4
5 D. American Water Works Association (AWWA):
6 1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through
7 48 in. for Water and Other Liquids.
8 2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure
9 Pipe and Fittings.
10 3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
11
12 E. National Fire Protection Association (NFPA):
13 1. NFPA 13 - Installation of Sprinkler Systems.
14 2. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
15 3. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

16
17 1.03 QUALITY ASSURANCE

- 18
19 A. Perform Work in accordance with NFPA 13.
20
21 B. Perform Work in accordance with state and local building codes.
22

23 1.04 CONTINUITY OF EXISTING SERVICES

- 24
25 A. Do not interrupt or change existing services without prior written approval from Owner's Project
26 Representative.
27
28 B. When interruption is required, coordinate scheduling of down-time with Owner to minimize disruption to
29 his activities.
30
31 C. Unless specifically stated, all work involved in interrupting or changing existing services is to be done
32 during normal working hours.
33

34 1.05 PROTECTION OF FINISHED SURFACES

- 35
36 A. Division 01 - General Requirements: Protection of Finished Surfaces.
37

38 1.06 SLEEVES AND OPENINGS

- 39
40 A. Division 01 - General Requirements: Sleeves and opening patching.
41

42 1.07 SEALING AND FIRESTOPPING

- 43
44 A. Sealing and firestopping of sleeves and related openings between piping and sleeve and structural
45 opening shall be responsibility of Contractor whose work penetrates opening.
46
47 B. Contractor responsible shall provide individuals skilled in such work to do sealing and fireproofing.
48

49 1.08 SUBMITTALS

- 50
51 A. Division 01- General Requirements: Submittal procedures.
52
53 B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
54 Indicate installation, layout, weights, mounting and support details, and piping connections.
55
56 C. Product Data: Submit manufacturer's catalogue information. Indicate valve data and ratings.

1
2 D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
3

4 1.09 CLOSEOUT SUBMITTALS
5

6 A. Division 01 – General Requirements: Closeout procedures.
7

8 B. Project As-Built: Record actual locations of components and tag numbering.
9

10 C. Operation and Maintenance Data: Submit spare parts lists.
11

12 1.10 GOVERNING AGENCIES
13

14 A. Comply with requirements of State and local fire codes.
15

16 1.11 OPERATING AND MAINTENANCE INSTRUCTIONS
17

18 A. Division 01 - General: Operating and maintenance instructions.
19

20 B. Assemble material in three-ring or post binders, using an index at front of each volume and tabs for each
21 system or type of equipment.
22

23 C. In addition to data indicated in the General Requirements, include the following information:
24

25 1. Copies of all approved shop drawings.

26 2. Records of tests performed to certify compliance with system requirements.

27 3. Certificates of inspection by regulatory agencies.

28 4. Parts lists for fixtures, equipment, valves and specialties.

29 5. Manufacturers' installation, operation and maintenance recommendations for fixtures, equipment,
30 valves and specialties.

31 6. Valve schedules.

32 7. Lubrication instructions, including parts list and frequency of lubrication.

33 8. Warranties.

34 9. Additional information as indicated in technical specification sections.
35

36 1.12 TRAINING OF OWNER PERSONNEL
37

38 A. Instruct Owner personnel in proper operation and maintenance of systems and equipment provided as part
39 of this project.

40 B. Include not less than 2 hours of instruction, using Operation and Maintenance manuals during this
41 instruction.
42

43 C. Demonstrate startup, operation, and shutdown procedures for all equipment. All training to be during
44 normal working hours. Videotape all instructions and provide Owner with copy.
45

46 1.13 AS-BUILTS AND RECORD DRAWINGS AND SPECIFICATIONS
47

48 A. Division 01 - General Requirements: As-builts, record drawings, and specifications.
49

50 1.14 QUALIFICATIONS
51

52 A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum
53 five years' experience, and with service facilities within 100 miles of Project.
54

55 B. Installer: Company specializing in performing Work of this section with minimum five years experience
56 approved by manufacturer.

1
2 1.15 PRE-INSTALLATION MEETINGS

- 3
4 A. Division 01- General Requirements: Pre-installation meeting.
5
6 B. Convene minimum one week prior to commencing work of this section.
7

8 1.16 DELIVERY, STORAGE, AND HANDLING

- 9
10 A. Division 01 – General Requirements: Product storage and handling requirements.
11
12 B. Deliver and store valves in shipping containers, with labeling in place.
13
14 C. Furnish cast iron and steel valves with temporary protective coating.
15
16 D. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
17

18 1.17 WARRANTY

- 19
20 A. Division 01 – General Requirements: Product warranties and product bonds.
21
22 B. Furnish five-year manufacturer warranty for basic fire suppression materials and methods.
23

24 1.18 EXTRA MATERIALS

- 25
26 A. Division 01 – General Requirements: Spare parts and maintenance products.
27
28 B. Furnish two sets of valve stem packing for each size and type of valve installed.
29

30 PART 2 - PRODUCTS

31
32 2.01 ABOVE GROUND PIPING

- 33
34 A. Steel Pipe: ASTM A53, Grade B; ASTM A135; or ASME B36.10; Schedule 40 black.
35 1. Steel Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM
36 A234, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME
37 B16.11, forged steel socket welded and threaded.
38 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings; ASME B16.4, threaded fittings.
39 3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
40 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped
41 elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
42 5. Mechanical Formed Fittings: Carbon-steel housing with integral pipe stop and O-ring pocked and
43 O-ring uniformly compressed into permanent mechanical engagement onto pipe.
44

45 2.02 PIPE HANGERS AND SUPPORTS

- 46
47 A. Conform to NFPA 13.
48
49 B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
50
51 C. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
52
53 D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
54
55 E. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
56

1 PART 3 - EXECUTION

2
3 3.01 PREPARATION

- 4
5 A. Ream pipe and tube ends. Remove burrs.
6
7 B. Remove scale and foreign material, from inside and outside, before assembly.
8
9 C. Prepare piping connections to equipment with flanges or unions.

10
11 3.02 INSTALLATION

- 12
13 A. Install piping in accordance with NFPA 13 for sprinkler systems.
14
15 B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
16
17 C. Install piping to conserve building space, to not interfere with use of space and other work.
18
19 D. Group piping whenever practical at common elevations.
20
21 E. Install pipe sleeve at piping penetrations through partitions, walls, and floors. Seal pipe and sleeve
22 penetrations to maintain fire resistance equivalent to fire separation.
23
24 F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected
25 equipment.
26
27 G. Pipe Hangers and Supports:
28 1. Install in accordance with NFPA 13.
29 2. Install hangers to with minimum 1/2 inch space between finished covering and adjacent work.
30 3. Place hangers within 12 inches of each horizontal elbow.
31 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement
32 without disengagement of supported pipe.
33 5. Where installing several pipes in parallel and at same elevation, provide multiple or trapeze
34 hangers.
35 6. Install copper plated hangers and supports for copper piping.
36 7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces,
37 pipe shafts, and suspended ceiling spaces are not considered exposed.
38
39 H. Slope piping and arrange systems to drain at low points. Install eccentric reducers to maintain top of pipe
40 level.
41
42 I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are
43 welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to
44 welding. Refer to Section 09 90 00 – Painting and Coating.
45
46 J. Do not penetrate building structural members unless indicated.
47
48 K. Where more than one piping system material is specified, install compatible system components and
49 joints. Install flanges, union, and couplings at locations requiring servicing.
50
51 L. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-
52 toxic joint compound applied to male threads only.
53

54 3.03 CLEANING

- 55
56 A. Division 01 – General Requirements: Final Cleaning.

1
2
3
4

B. Clean entire system after other construction is complete.

END OF SECTION 21 05 00

SECTION 21 13 13

WET-PIPE FIRE SUPPRESSIONSPRINKLERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wet-pipe sprinkler system, system design, installation, and certification.

B. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 21 05 00 – Basic Fire Suppression Materials and Methods.

1.02 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 13 - Installation of Sprinkler Systems.

1.03 SYSTEM DESCRIPTION

A. System to provide coverage for building areas noted.

B. Provide hydraulically designed system to NFPA 13 Light Hazard occupancy requirements.

C. Determine volume and pressure of incoming water supply from water flow test data.

D. Interface system with building fire and smoke alarm system.

1.04 SUBMITTALS

A. Division 01 - General Requirements: Submittal procedures.

B. Shop Drawings:

1. Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation.
2. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories.
3. Indicate system controls.

C. Product Data:

1. Submit data on sprinklers, valves, and specialties, including manufacturers catalog information.
2. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

D. Samples: Submit two of each style of sprinkler specified.

E. Design Data: Submit design calculations; signed and sealed by professional engineer licensed in the State of Wisconsin

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 – General Requirements: Contract Closeout Procedures.

- 1 B. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings.
2 Indicate drain and test locations.
3
- 4 C. Operation and Maintenance Data: Submit components of system, servicing requirements, record
5 drawings, inspection data, replacement part numbers and availability, and location and numbers of
6 service depot.
7
- 8 1.06 QUALITY ASSURANCE
9
- 10 A. Perform Work in accordance with NFPA 13.
11
- 12 B. Perform Work in accordance with state and local building codes.
13
- 14 1.07 QUALIFICATIONS
15
- 16 A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum
17 five years experience.
18
- 19 B. Installer: Company specializing in performing Work of this section with minimum five years documented
20 experience approved by manufacturer.
21
- 22 C. Design system under direct supervision of Professional Engineer experienced in design of this Work and
23 licensed in State of Wisconsin.
24
- 25 1.08 PRE-INSTALLATION MEETINGS
26
- 27 A. Division 01 – General Requirements: Conferences.
28
- 29 B. Convene minimum one week prior to commencing work of this section.
30
- 31 1.09 DELIVERY, STORAGE, AND HANDLING
32
- 33 A. Division 01 – General Requirements.
34
- 35 B. Store products in shipping containers until installation.
36
- 37 C. Furnish piping with temporary inlet and outlet caps until installation.
38
- 39 1.10 WARRANTY
40
- 41 A. Division 01 – General Requirements
42
- 43 B. Furnish five year manufacturer warranty.
44
- 45 1.11 EXTRA MATERIALS
46
- 47 A. Division 01 – General Requirements: Spare parts and maintenance materials.
48
- 49 B. Furnish extra sprinklers under provisions of NFPA 13.
50
- 51 C. Furnish suitable wrenches for each sprinkler type.
52
- 53 PART 2 - PRODUCTS
54
- 55 2.01 SPRINKLERS
56

- 1 A. Suspended Ceiling:
2 1. Manufacturers:
3 a. Viking.
4 b. Tyco.
5 c. Globe.
6 d. Substitutions: In accordance with Division 01- General Requirements.
7 2. Type: Concealed pendant type with matching screw on escutcheon plate.
8 3. Finish: Chrome plated. Enamel, color as selected.
9 4. Escutcheon Plate Finish: Chrome plated. Enamel, color as selected.
10 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
11
- 12 B. Exposed Area Type:
13 1. Manufacturers:
14 a. Viking.
15 b. Tyco.
16 c. Globe
17 d. Substitutions: In accordance with Division 01- General Requirements.
18 2. Type: Standard upright type.
19 3. Finish: Chrome plated. Enamel, color as selected.
20 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
21

22 PART 3 - EXECUTION

23
24 3.01 INSTALLATION

- 25
26 A. Install in accordance with NFPA 13.
27
28 B. Place pipe runs to minimize obstruction to other work.
29
30 C. Install piping in concealed spaces above finished ceilings.
31
32 D. Center sprinklers in two directions in ceiling tile and install piping offsets.
33
34 E. Hydrostatically test entire system.
35
36 F. Require test be witnessed by Authority having jurisdiction
37

38 3.02 INTERFACE WITH OTHER PRODUCTS

- 39
40 A. Verify signal devices are installed and connected to fire alarm system.
41

42 3.03 CLEANING

- 43
44 A. Division 01 – General Requirements: Final cleaning.
45
46 B. Flush entire piping system of foreign matter.
47

48 3.04 PROTECTION OF INSTALLED CONSTRUCTION

- 49
50 A. Division 01 – General Requirements: Protecting installed construction.
51
52 B. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler
53 escutcheons not receiving field paint finish. Remove after painting.
54
55

END OF SECTION 21 13 13

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SECTION 23 05 00

BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Reference Standards.
2. References.
3. Regulatory Requirements.
4. Quality Assurance.
5. Drawings.
6. Continuity of Existing Services.
7. Protection of Products and Finished Surfaces.
8. Sleeves and Openings.
9. Sealing and Firestopping.
10. Equipment Furnished By Owner.
11. Provisions for Future.
12. Product Substitution Procedures.
13. Submittals.
14. Off Site Storage.
15. Request and Certification for Payment.
16. Certificates and Inspections.
17. Operating and Maintenance Instructions.
18. Training of Owner Personnel.
19. Record Drawings.
20. Manufacturer's Field Services and Reports.
21. Sustainable Design Submittals.
22. Indoor Air Quality.
23. Access Panels and Doors.
24. Identification.
25. Demolition.
26. Excavation and Backfill.
27. Concrete Work.
28. Cutting and Patching.
29. Building Access.
30. Equipment Access.
31. Coordination.
32. Lubrication.
33. HVAC Painting.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 09 90 00 – Painting.
3. Section 23 33 00 - Air Duct Accessories.

1.02 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1. AABC Associated Air Balance Council.
2. ABMA American Boiler Manufacturers Association.
3. ADC Air Diffusion Council.
4. AGA American Gas Association.

1	5.	AMCA	Air Movement and Control Association.
2	6.	ANSI	American National Standards Institute.
3	7.	ARI	Air-Conditioning and Refrigeration Institute.
4	8.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning
5		Engineers	
6	9.	ASME	American Society of Mechanical Engineers.
7	10.	ASTM	American Society for Testing and Materials.
8	11.	AWWA	American Water Works Association.
9	12.	AWS	American Welding Society.
10	13.	CGA	Compressed Gas Association.
11	14.	CTI	Cooling Tower Institute.
12	15.	EPA	Environmental Protection Agency.
13	16.	GAMA	Gas Appliance Manufacturers Association.
14	17.	IEEE	Institute of Electrical and Electronics Engineers.
15	18.	ISA	Instrument Society of America.
16	19.	MCA	Mechanical Contractors Association.
17	20.	MICA	Midwest Insulation Contractors Association.
18	21.	MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry,
19		Inc.	
20	22.	NBS	National Bureau of Standards.
21	23.	NEBB	National Environmental Balancing Bureau.
22	24.	NEC	National Electric Code.
23	25.	NEMA	National Electrical Manufacturers Association.
24	26.	NFPA	National Fire Protection Association.
25	27.	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association,
26		Inc.	
27	28.	UL	Underwriters Laboratories Inc.

29 1.03 REFERENCES

- 30
- 31 A. ASTM International
- 32 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- 33 2. ASTM E814 - Test Method for Fire Tests of Through-Penetration Fire Stops.
- 34
- 35 B. Underwriters Laboratories, Inc. (UL)
- 36 1. UL 1479 - Fire Tests of Through-Penetration Firestops.
- 37 2. UL 723 - Surface Burning Characteristics of Building Materials.
- 38
- 39 C. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA)
- 40 1. SMACNA – IAQ Guidelines for Occupied Buildings Under Construction.
- 41

42 1.04 REGULATORY REQUIREMENTS

- 43
- 44 A. Specified systems shall be installed in compliance with federal, state and local codes and regulations.
- 45
- 46 B. Contractor shall secure and pay for permits, licenses and certificates of inspection applicable to this work.
- 47
- 48 C. Contractor shall pay taxes applicable to this work.
- 49

50 1.05 QUALITY ASSURANCE

- 51
- 52 A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings,
- 53 or engineering parameters from those indicated in the Contract Documents, Contractor is responsible for
- 54 all costs involved in integrating equipment or accessories into system and for obtaining performance from
- 55 system into which these items are placed.
- 56

- 1 B. This may include changes found necessary during testing, adjusting, and balancing phase of project.
2
3 C. System design is based on manufacturer indicated on drawing schedules. Additional listed manufacturers
4 may be used in base bid provided that this Division of work assumes responsibility for correct size and
5 capacity, space limitations and plumbing, mechanical and electrical deviations.
6
7 D. This responsibility also includes any redesign of structure, foundations, utilities, piping, HVAC, wiring or
8 any other part of structural, mechanical, sanitary or electrical work. Cost of redesign, drawings, detailing
9 and accompanying additional costs of items of work shall be paid by this Division of work, and redesign
10 shall be subject to approval of Engineer.
11

12 1.06 DRAWINGS

- 13
14 A. Drawings show general arrangement of piping, equipment and appurtenances and shall be followed as
15 close as possible actual building construction and work of other Contractors.
16
17 B. Work shall conform to requirements indicated on Drawings. Architectural and structural Drawings shall
18 take precedence.
19
20 C. Due to scale of Drawings, it is not possible to indicate all offsets, fittings and accessories that may be
21 required.
22
23 D. Investigate architectural and structural conditions affecting work and arrange work accordingly,
24 providing offsets, fittings and accessories as may be required to meet constructed design.
25
26 E. HVAC equipment and systems, including piping and ductwork shall also be installed to maintain required
27 operation and maintenance clearances.
28
29 F. Work shall conform to requirements indicated on the Drawings
30

31 1.07 CONTINUITY OF EXISTING SERVICES

- 32
33 A. Do not interrupt or change existing services without prior written approval from Owner's Representative.
34
35 B. When interruption is required, coordinate down-time with Owner to minimize disruption to his activities.
36
37 C. Unless specifically stated, all work involved in interrupting or changing existing services is to be done
38 during normal working hours.
39

40 1.08 PROTECTION OF PRODUCTS AND FINISHED SURFACES

- 41
42 A. Furnish one can of touch-up paint for each different color factory finish which is to be final finished
43 surface of product.
44
45 B. Deliver touch-up paint with other "loose and detachable parts" to Owner as specified.
46
47 C. Transport and handle products in accordance with manufacturer's instruction.
48
49 D. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and
50 products are undamaged.
51
52 E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or
53 damage.
54
55 F. Store and protect products in accordance with manufacturer's instructions.
56

- 1 G. Store with seals and labels intact and legible.
2
3 H. Store sensitive products in weather tight, climate controlled, enclosures in environment favorable to
4 product.
5
6 I. For exterior storage of fabricated products, place on sloped supports above ground.
7
8 J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent
9 condensation and degradation of products.
10
11 K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are
12 undamaged and are maintained in acceptable condition.
13
14 L. Structural mechanical iron, iron pipe supports, platforms, and any equipment which is not furnished with
15 enamel prime coat finish and furnished under this section of work, shall be wire brushed free of rust and
16 scale and given two (2) coats of brown colored rust-proof paint applied by this Division of Work.
17
18 M. Any surfaces of existing or new equipment, in areas of work where finish has been used or destroyed,
19 shall be refinished to match original finish.
20

21 1.09 SLEEVES AND OPENINGS
22

- 23 A. Sleeve Requirements:
24 1. Provide steel pipe for sleeves penetrating floors.
25 2. Set sleeves two inches above floor of equipment rooms and caulk tight so water leakage cannot
26 occur between sleeves and floors.
27 3. Furnish each sleeve having an inside diameter one inch larger than outside diameter of each
28 uncovered pipe and one inch larger than outside diameter of covering for each covered pipe.
29 4. Pack void between sleeve and pipe or insulate with fire retardant insulation and caulking.
30 5. Provide 18 gage galvanized sleeves for ducts passing through walls of concrete or masonry, and
31 critical walls of other types of construction.
32 6. For ducts through floor construction of equipment rooms, extend sleeve two inches above floor
33 and finish off with 2-inch x 2-inch angles and caulk tight so water leakage cannot occur between
34 sleeves and floor.
35 7. Sleeves for ductwork shall be one inch larger than outside duct dimensions and of sufficient length
36 to pass through entire floor, wall or roof construction including finish.
37 8. Pack void between sleeves and duct or insulation with fire retardant insulation and caulking.
38
39 B. Curb and Base Requirements:
40 1. Contractor shall provide concrete bases, footing, piers, platforms, and curbs for equipment as
41 required or as indicated on Drawings or identified in specification sections.
42 2. Contractor shall be responsible for location, size and any changes required by substitution of
43 equipment.
44 3. Provide alignment, foundation template drawings, anchor bolts and Embeco non-shrink grouting
45 for bases in accordance with manufacturer's instructions.
46 4. Rigging and Setting of Curbs:
47 a. Contractor shall rig unit curbs and set counter-flashing of curbs.
48 b. Curbs shall be set and shimmed level.
49

50 1.10 SEALING AND FIRESTOPPING
51

- 52 A. Sealing and firestopping of sleeves/openings between ductwork, piping, and sleeves, structural or
53 partition opening shall be responsibility of Contractor whose work penetrates an opening.
54
55 B. Responsible Contractor shall hire individuals skilled in such work, such as sealing and fireproofing.
56 These individuals hired shall normally and routinely be employed in sealing and fireproofing occupation.

1
2 1.11 PRODUCT SUBSTITUTION PROCEDURES
3

- 4 A. Engineer will consider requests for Substitutions only within 15 days after date of Owner-Contractor
5 Agreement.
6
7 B. Substitutions may be considered when product becomes unavailable through no fault of Contractor.
8
9 C. Document each request with complete data substantiating compliance of proposed Substitution with
10 Contract Documents.
11
12 D. Request constitutes representation that Contractor:
13 1. Has investigated proposed product and determined that it meets or exceeds quality level of
14 specified product.
15 2. Will provide same warranty for Substitution as for specified product.
16 3. Will coordinate installation and make changes to other Divisions of Work that may be required for
17 their Work to be complete with no additional cost to Owner.
18 4. Waives claims for additional costs or time extension that may subsequently become apparent.
19 5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval
20 by authorities having jurisdiction.
21
22 E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data
23 submittals, without separate written request, or when acceptance will require revision to Contract
24 Documents.
25
26 F. Substitution Submittal Procedure:
27 1. Submit electronic request for Substitution for consideration. Limit each request to one proposed
28 Substitution.
29 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product
30 equivalence. Burden of proof is on proposer.
31 3. Engineer will notify Contractor in writing of decision to accept or reject request.
32
33 G. Only one request for substitution will be considered for each product. When substitution is not accepted,
34 provide specified product.
35
36 H. Product substitutions which alter design concept or require other system modifications to base bid designs
37 shall disclose all required modifications during shop drawing review stage. Any additional components
38 shall be responsibility of party requesting substitution.
39

40 1.12 SUBMITTALS
41

- 42 A. Division 01 - Submittal Procedures: Requirements for submittals.
43
44 B. Submit for equipment and systems as indicated in respective specification sections, marking each
45 submittal with that specification section number.
46
47 C. Mark general catalog sheets and drawings to indicate specific items being submitted and proper
48 identification of equipment by name and/or number, as indicated in Contract Documents.
49
50 D. Before submitting electrically powered equipment, verify that electrical power and control requirements
51 for equipment are in agreement with motor starter schedule on electrical Drawings.
52
53 E. Contractor shall include statement on Shop Drawing transmittal to Engineer/Architect that equipment
54 submitted and motor starter schedule are in agreement or indicate any discrepancies.
55
56 F. Include wiring diagrams of electrically powered equipment.

- 1
2 G. Submit Shop Drawings in electronic format for review.
3
4 H. Shop Drawings Submittal Procedures:
5 1. Shop drawings shall include detailed dimensions, capacities, gauges, arrangement and operating
6 clearances.
7 2. Incomplete submittals shall not be reviewed and Contractor will be held responsible for correction
8 of work not having final approval.
9 3. Engineer will review or take other appropriate action on Contractor submittals, such as certified
10 shop drawings, product data, samples and other data, which Contractor is required to submit, but
11 only for limited purpose of checking for conformance with design concept and Contract
12 Documents.
13 4. This review shall not include review of accuracy or completeness of details, such as quantities,
14 dimensions, capacities, weights or gauges, fabrication processes, construction means or methods,
15 coordination of work with other trades or construction safety precautions, all of which are sole
16 responsibility of Contractor.
17 5. Engineer's review will be conducted with reasonable promptness while allowing sufficient time in
18 Engineer's judgment to permit adequate review.
19 6. Review of specific items shall not indicate that Engineer has reviewed entire assembly of which
20 said item is a component.
21 7. Engineer will not be responsible for any deviations from Contract Documents not submitted to
22 Engineer in writing by Contractor.
23 8. Engineer will not be required to review partial submissions or those for which submissions of
24 correlated items have not been received.
25 9. Review of certified drawings does not relieve Contractor of responsibility of furnishing and
26 installing all system components, as per drawings and specifications for proper system operation
27 with particular respect to BTU outputs, water and air flow capacities, minimum noise
28 requirements and space limitations, nor from responsibility for errors or omissions of any sort in
29 submittal drawings.
30 10. Engineer assumes no responsibility for Contractor calculated dimensions or exact quantities of
31 materials on shop drawings.
32 11. Reviews by Engineer are subject to limitations of General Conditions of Contract for construction.
33 12. Contractor shall thoroughly check all shop drawings prepared by subcontractors for materials or
34 equipment suppliers with regard to measurements, size of members, materials and details to satisfy
35 specifications and drawings.
36 13. Each drawing shall have date of approval and signature of Contractor's reviewer.
37 14. If Contractor's shop drawings have been submitted and reviewed by Engineer for particular
38 product and Engineer has stamped "rejected", "revised and resubmit" or "submit specified items"
39 after two reviews, any further review by Engineer for that particular product will require
40 contractor to compensate Engineer for time spent for further review of that product at rate of One
41 Hundred Fifty Dollars (\$150.00) per hour.
42 15. Furnish approved and corrected shop drawings to all other Contractors whose work is affected.
43
44 I. Contractor shall provide all utility rebate forms, completely filled out, for owner signature if such rebates
45 are included in contractor pricing, recommended through product substitutions or if utility rebate program
46 requirements are stated in other equipment product specification sections setting minimum performance
47 requirements.
48
49 J. Not more than two weeks after award of contract, but before any Shop Drawings are submitted,
50 Contractor shall submit the following piping system data sheet for each piping service on project.
51

1	<u>Item</u>	<u>Pipe Size (Inches)</u>	<u>List each piping service</u>	<u>Remarks</u>
2				
3	Pipe	2 & smaller		
4		2-1/2 - 4		
5		5 & larger		
6	Fittings	2 & smaller		
7		2-1/2 & larger		
8	Nipples			
9	Branch takeoffs	2 & smaller		
10	D=main, d=branch	2-1/2 & larger		
11	Gate valves	2 & smaller		
12		2-1/2 & larger		
13	Ball valves	2 & smaller		
14	Butterfly	2-1/2 & larger		
15	Balancing valves	2 & smaller		
16		2-1/2 & larger		
17	Globe valves	2 & smaller		
18		2-1/2 & larger		
19	Check valves	2 & smaller		
20		2-1/2 & larger		
21	Silent check valves	2 & smaller		
22		2-1/2 & larger		
23	Stop & check valves	2 & smaller		
24		2-1/2 & larger		
25	Triple duty valves	2 & smaller		
26		2-1/2 & larger		
27	Flowmeters	2 & smaller		
28		2-1/2 & larger		
29	Strainers	2 & smaller		
30		2-1/2 & larger		
31	Thermometers	Mfr & scale		
32	Press gauges	Mfr & scale		
33	Steam traps	Mfr & type		
34	Insulation by pipe size	less than 1-1/4		
35	(Type & thickness)	1-1/4 - 2		
36		2-1/2 - 4		
37		5 - 6		
38		over 6		
39	Hangers	Type, mfr & figure no.		
40	Hanger accessories			
41	Pipe identification			
42	List of specialties and accessories:			
43				
44	1.13	OFF SITE STORAGE		
45				
46	A.	Prior approval by Owner's Representative is required.		
47				
48	B.	Ductwork and metal for making ductwork, duct lining, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for offsite storage.		
49				
50				
51	C.	For pipe material that can be stored off site, no material will be accepted for off-site storage unless Shop Drawings for that material have been approved.		
52				
53				
54	D.	Provide proof of bonded and insured off-site storage and protection when site does not permit on-site storage or protection.		
55				
56				

1 E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent
2 condensation and degradation of products.

3
4 F. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are
5 undamaged and are maintained in acceptable condition.

6
7 1.14 CERTIFICATES AND INSPECTIONS

8
9 A. Obtain and pay for Authorities Having Jurisdiction required inspections except those provided by
10 Engineer/Architect in accordance with governing building code.

11
12 B. Deliver originals of these certificates to Engineer/Architect.

13
14 C. Include copies of certificates in Operating and Maintenance Manuals.

15
16 1.15 OPERATING AND MAINTENANCE MANUALS

17
18 A. Contractor shall submit to Engineer for review three bound copies of typewritten instructions covering
19 complete maintenance and operation of the system.

20
21 B. Assemble material in three-ring or post binders, using index at front of each volume and tabs for each
22 system or type of equipment. In addition to data indicated in General Requirements, include following
23 information:

- 24 1. Copies of all approved Shop Drawings.
- 25 2. Manufacturer's wiring diagrams for electrically powered equipment.
- 26 3. Records of tests performed to certify compliance with system requirements.
- 27 4. Certificates of inspection by regulatory agencies.
- 28 5. Temperature control Record Drawings and control sequences.
- 29 6. Parts lists for manufactured equipment.
- 30 7. Valve schedules.
- 31 8. Lubrication instructions, including list/frequency of lubrication done during construction.
- 32 9. Warranties.
- 33 10. Testing, Adjusting and Balancing Data.
- 34 11. Additional information as indicated in technical specification sections.

35
36 C. Maintenance instructions shall include manufacturer's literature on system major equipment components.

37
38 D. Maintenance instructions shall be explicit concerning time intervals for servicing and preventative
39 maintenance, type and grades of oil and grease, packing materials, normal and abnormal clearances,
40 cleaning, methods of equipment adjustments and complete description and list of replacement parts and
41 materials for wearing items.

42
43 E. Operation instructions shall include detailed step-by-step startup and shutdown procedures, normal
44 operating ranges such as temperatures and pressures and yearly system changeover procedure.

45
46 1.16 TRAINING OF OWNER PERSONNEL

47
48 A. Instruct Owner's personnel in proper operation and maintenance of systems and equipment provided as
49 part of this project. Record video and audio of all training sessions.

50
51 B. Include not less than 4 hours of instruction, over total of 2 training sessions, using Operating and
52 Maintenance manuals during this instruction.

53
54 C. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal
55 working hours.

56

1 D. Coordinate with Owner at least two weeks prior to scheduling training sessions.

2
3 1.17 RECORD DRAWINGS

4
5 A. In addition to data required by General Conditions, maintain temperature control Record Drawings on
6 originals prepared by installing contractor and subcontractor. Include copies of these Record Drawings
7 with Operating and Maintenance manuals.

8
9 B. Record Drawings shall be maintained by the Contractor on a daily basis.

10
11 1.18 MANUFACTURERS' FIELD SERVICES AND REPORTS

12
13 A. When specified in individual specification Sections, require material or product suppliers or
14 manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and
15 installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as
16 applicable, and to initiate instructions when necessary.

17
18 B. Submit qualifications of observer to Owner 30 days in advance of required observations. Observer is
19 subject to approval of Engineer/Architect and Owner.

20
21 C. Individuals are to report observations and site decisions or instructions given to applicators or installers
22 that are supplemental or contrary to manufacturers' written instructions.

23
24 D. Submit report in duplicate within (15) fifteen days of observation to Engineer for review.

25
26 1.19 WARRANTIES

27
28 A. Contractor warrants to Owner that all materials and supplies used in Work are free from all liens, claims
29 or encumbrances, and good title to materials and supplies is retained by Contractor and shall be conveyed
30 to Owner on or before date of Substantial Completion.

31
32 B. Contractor warrants to Owner that all materials and equipment furnished under Contract will be of good
33 quality and new, unless otherwise required or permitted by Contract Documents, that Work will be free
34 from defects not inherent in quality required or permitted, and that Work will strictly conform with
35 requirements of Contract Documents. Work not conforming to these requirements, including substitutions
36 not properly approved and authorized, may be considered defective.

37
38 C. Printed, signed copies of Manufacturer's warranties which are required by Contract Documents shall be
39 presented to Architect/Engineer prior to approval of final payment.

40
41 D. All warranties, including manufacturer's warranties and Contractor warranties shall take effect on date of
42 Substantial Completion and shall remain in effect for period of one year (1) year thereafter, unless
43 Contract Documents specifically require different warranty period.

44
45 E. If any part of Work is declared Substantially Complete by Architect/Engineer, and Owner/Users take
46 possession of that portion of Work before completion of entire Project, warranty for that portion of Work
47 shall continue for period of one (1) year from date of Substantial Completion for that portion of Work,
48 unless Contract Documents specifically require different warranty period.

49
50 F. Contractor shall remedy at Contractor's expense, any defect in Work. In addition, Contractor shall
51 remedy at Contractor's expense, any damage to County owned or controlled real or personal property,
52 when damage is result of:

53 1. Contractor's failure to conform to Contract Document requirements; or

54 2. Any defect in equipment, material, Workmanship or design furnished by Contractor or
55 Subcontractor or supplier, regardless of tier.

- 1 G. Contractor shall warrant any Work restored or replaced due to damage caused in fulfilling terms and
2 conditions of this Article, or during performance of any Work required by Contract Documents.
3 Contractor's warranty with respect to Work repaired or replaced will run for one (1) year from date of
4 Substantial Completion of said repair or replacement.
5
6 H. Owner or Owner's representative shall notify Contractor, in writing, within reasonable time after
7 discovery of any failure, defect, or damage.
8
9 I. If, after receipt of Notice of claim under this warranty, Contractor fails to remedy any failure, defect or
10 damage within time judged reasonable by Architect/Engineer, Owner shall have right to replace, repair,
11 or otherwise remedy failure, defect, or damage, at Contractor's expense.
12

13 1.20 INDOOR AIR QUALITY

- 14 A. Coordinate requirements of Section 01 52 00 – Indoor Air Quality with work of other trades.
15
16 B. SMACNA – IAQ Guidelines for Occupied Buildings under Construction apply.
17
18 C. Maintain temporary filter media over return air openings on a regular basis.
19
20 D. Provide temporary capping of ductwork openings to prevent entry of dirt, dust, and foreign material.
21
22 E. Protect diffusers, registers, and grilles with plastic wrap or some other approved form of protection to
23 maintain dirt and dust free and to prevent entry of dirt, dust, and foreign material into ductwork.
24
25 F. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to
26 prevent construction dust from entering ductwork system.
27
28

29 PART 2 - PRODUCTS

30 31 2.01 ACCESS PANELS AND DOORS

- 32
33 A. Lay-in Ceilings: Removable lay-in ceiling tiles in 2 x 2-foot or 2 x 4-foot configuration provided under
34 Division 09 – Finishes are sufficient. No additional access provisions are required unless specifically
35 indicated.
36
37 B. Plaster Walls and Ceilings: 16-gauge frame with not less than 20-gauge hinged door panel, prime coated
38 steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed
39 hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL
40 listed for use in fire rated partitions if required by application. Use largest size access opening possible,
41 consistent with space and equipment needing service; minimum size is 12 x 12-inch.
42

43 2.02 IDENTIFICATION

- 44
45 A. Stencils: With clean cut symbols and letters of following size:
46 1. Up to 2 inch Outside Diameter of Insulation or Pipe: ½ inch high letters.
47 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1 inch high letters.
48 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inch high letters.
49 4. Ductwork and Equipment: 1-3/4 inch high letters.
50 5. Stencil Paint: As specified in Article 9, semi-gloss enamel, colors and lettering size conforming to
51 ASME A13.1.
52
53 B. Snap-On Pipe Markers: Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held
54 tightly in place without use of adhesive, tape or straps. Not less than one-inch high letters/numbers and
55 flow direction arrows for piping marking.
56 1. W. H. Brady.

2. Seton.
3. Marking Services.
4. Champion America.
5. Equivalent as acceptable to Engineer.

C. Engraved Name Plates: White letters on black background, 1/16-inch thick plastic laminate, beveled edges, screw mounting.

1. Setonply Style 2060 by Seton Name Plate Company.
2. Emedolite- Style EIP by EMED Co.
3. Marking Services.
4. W. H. Brady.
5. Equivalent as acceptable to Engineer.

D. 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 valve stem.

1. EMED Co.
2. Seton Name Plate Company.
3. Marking Services.
4. W. H. Brady.
5. Equivalent as acceptable to Engineer.

E. Information Tags:

1. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

F. Plastic Tags:

1. Laminated three layer plastic with engraved black letters on white contrasting background color. Tag size minimum 1-1/2 inches diameter.

2.03 NON-RATED PENETRATIONS

A. Pipe Penetrations Through Below Grade Walls: In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between uninsulated pipe and cored opening or water-stop type wall sleeve.

B. 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.

C. Duct Penetrations:

1. Annular space between duct, with or without insulation, and non-rated partition or floor opening shall not be larger than two inches. Where existing openings have annular space larger than two inches, patch space to match existing construction to within two inches around duct.
2. Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation. Provide four-inch sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.

PART 3 - EXECUTION

3.01 DEMOLITION

A. Perform all demolition as indicated on Drawings to accomplish new work.

B. Where demolition work is to be performed adjacent to existing work that remains in occupied area, construct temporary dust partition to minimize amount of contamination of occupied space.

- 1
- 2 C. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if
- 3 they were new work.
- 4
- 5 D. Coordinate work with Owner to minimize disruption to existing building occupants.
- 6
- 7 E. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned,
- 8 or deactivated are to be removed from site by Contractor.
- 9
- 10 F. Piping and ductwork specialties are to be removed from site by Contractor unless they are dismantled and
- 11 removed or stored by Owner.
- 12
- 13 G. Designated equipment is to be turned over to Owner for its use at place and time so designated.
- 14
- 15 H. Maintain condition of material and equipment that is indicated to be reused equal to that existing before
- 16 work began.
- 17

18 3.02 CUTTING AND PATCHING

- 19
- 20 A. Contractor shall perform cutting and patching of existing general construction as required
- 21 accommodating new systems.
- 22
- 23 B. Cutting and patching of existing general construction (except pipe openings), as required to accommodate
- 24 new system, will be provided by General Contractor
- 25
- 26 C. If Contractor should neglect to inform other Sections of work of his opening requirements before that
- 27 portion of building construction has been complete, this Contractor shall cut their own openings and
- 28 provide framing and lintels as required.
- 29
- 30 D. Before cutting or drilling, he must obtain permission from Engineer/Architect, and he shall repair any
- 31 damage to Engineer/Architect satisfaction.
- 32
- 33 E. In event holes must be cut through reinforced concrete, drill carefully so as to avoid spalling and
- 34 unnecessary damage or weakening of structural members.
- 35
- 36 F. No chopping or breaking will be permitted.
- 37
- 38 G. Repair surfaces damaged during installation of new system to complete satisfaction of Owner's
- 39 Representative.
- 40
- 41 H. Do not cut through any building structural members without prior approval from Engineer/Architect.
- 42
- 43 I. Openings in general construction shall be neatly cut with smooth edges and opening shall be made only
- 44 large enough to accommodate new system.
- 45
- 46 J. Pipe openings through reinforced concrete construction shall be core drilled.
- 47
- 48 K. Other openings shall be machine sawed.
- 49
- 50 L. Breaking or chopping out will not be permitted.
- 51

52 3.03 BUILDING ACCESS

- 53
- 54 A. Arrange for necessary openings in building to allow for admittance of all apparatus.
- 55
- 56 B. When building access was not previously arranged and must be provided by this Contractor, restore any

1 opening to its original condition after apparatus has been brought into building.
2

3 3.04 EQUIPMENT ACCESS
4

- 5 A. Install piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and
6 service.
7
8 B. Coordinate exact location of wall and ceiling access panels and doors with General Contractor, making
9 sure that access is available for all equipment and specialties.
10
11 C. Where access is required in plaster walls or ceilings, furnish access doors to General Contractor.
12
13 D. Provide color-coded thumb tacks or screws, depending on surface, for use in accessible ceilings which do
14 not require access panels.
15

16 3.05 COORDINATION
17

- 18 A. Verify that devices are compatible for surfaces on which they will be used including, but not limited to,
19 diffusers, register, grilles, and recessed or semi-recessed heating and cooling terminal units installed in or
20 on architectural surfaces.
21
22 B. Coordinate work with other contractors prior to installation.
23
24 C. Any installed work that is not coordinated and that interferes with other contractor's work shall be
25 removed or relocated at installing contractor's expense.
26
27 D. Cooperate with test and balance agency in ensuring compliance with Section 23 05 93 – Testing,
28 Adjusting and Balancing for HVAC.
29
30 E. Verify system completion to test and balance agency including:
31 1. Flushing.
32 2. Pressure testing.
33 3. Chemical treatment.
34 4. Filling of liquid systems.
35 5. Pressurization and air venting of hydronic systems.
36 6. Provide clean filters.
37 7. Provide clean strainers.
38 8. Duct and pipe system cleaning.
39 9. Controls adjusted and calibrated.
40 10. Controls cycled through their sequences are ready for testing, adjusting and balancing work.
41
42 F. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, and temperature controls
43 required for functional and balanced systems.
44
45 G. Demonstrate starting, interlocking and control features of each system so test and balance agency can
46 perform its work.
47

48 3.06 IDENTIFICATION
49

- 50 A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one
51 coat of black enamel against a light background or white enamel against dark background.
52
53 B. Install identifying devices after completion of coverings and paint.
54
55 C. For unfinished canvas covering, apply paint primer before applying labels.
56

- 1 D. Use primer where necessary for proper paint adhesion.
2
3 E. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.
4
5 F. Where stenciling is not appropriate for equipment identification, engraved nameplates may be used.
6
7 G. Identify concealed or exposed piping not less than once every 30 feet including risers and drops, not less
8 than once in each room, adjacent to each access door or panel, and on both side of partition where piping
9 passes through walls, floors, or roofs.
10 1. Identify service, [pressure] and flow direction at each pipe identification location.
11 2. Install in clear view and align with axis of pipe.
12
13 H. Identify valves with brass tags bearing system identification and valve sequence number. Install tags
14 using corrosion resistant chain, number tags consecutively.
15
16 I. Valve tags are not required at terminal device unless valves are greater than ten feet from device or
17 located in another room not visible from terminal unit.
18
19 J. Provide typewritten valve schedule indicating valve number and equipment or areas supplied by each
20 valve.
21 1. Locate schedules in each mechanical room.
22 2. Under clear plastic frame provide in each Operating and Maintenance manual.
23
24 K. Use engraved nameplates to identify control equipment, air handling units, pumps, VFD's, heat transfer
25 equipment, tanks and water treatment devices.
26 1. Install nameplates with corrosive resistant mechanical fasteners or adhesive.
27
28 L. Identify all fire and smoke dampers. Dampers shall be permanently identified on exterior of duct with
29 label, or painted, having minimum letter height of one-inch. Identification shall read either "Fire
30 Damper", "Smoke Damper", or "Fire/Smoke Damper".
31
32 M. Small devices such as in-line pumps may be identified with tags.
33

34 3.07 LUBRICATION

- 36 A. Lubricate bearings with lubricant as instructed by manufacturer before equipment is operated for any
37 reason.
38
39 B. Once equipment has been run, maintain lubrication in accordance with manufacturer's instructions until
40 work is accepted by Engineer/Architect.
41
42 C. Maintain log of lubricants used and frequency of lubrication and include this information in Operating
43 and Maintenance Manuals at completion of project.
44

45 3.08 SLEEVES

- 47 A. Pipe Sleeves:
48 1. Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to
49 provide a backing for sealant or firestopping.
50 2. Patch wall around sleeve to match adjacent wall construction and finish.
51 3. Grout area around sleeve in masonry construction.
52 4. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall
53 be installed flush with face of wall.
54 5. Pipe sleeves are not required in interior non-rated drywall, plaster, or wood partitions and sleeves
55 are not required in existing poured concrete walls where penetrations are core drilled.
56 6. 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.

7. Extend top of sleeve one-inch above adjacent floor in piping floor penetrations located in mechanical rooms and wet locations listed below. In finished areas, sleeves shall be flush with rough floor.
8. For floor pipe penetrations through existing floors in mechanical rooms, core drill opening and provide 1-1/2 x 1-1/2 x 1/8-inch galvanized steel angles fastened to floor surrounding penetration or group of penetrations to prevent water from getting to penetration.
9. Place urethane sealant between angles and floor and fasten angles to floor minimum 8 inches on center.
10. Seal corners water tight with urethane sealant or core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout.
11. If pipe penetrating sleeve is supported by pipe clamp resting on sleeve, weld collar or struts to sleeve that will transfer weight to existing floor structure.
12. Size sleeve to allow insulated pipe to run through sleeve and paint sleeve.
13. 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.

B. Duct Sleeves:

1. Duct sleeves are not required in non-rated partitions or floors.
2. Provide sleeve required for fire dampers in fire-rated partitions and floors.
3. Reference fire damper details on Drawings.
4. For duct penetrations through mechanical room floors, provide 1-1/2 x 1-1/2 x 1/8-inch galvanized steel angles fastened to floor around perimeter of duct opening to prevent water from getting to floor opening.
5. Provide urethane caulk between angles and floor and fasten angles to floor 8 inches on center.
6. Seal corners water tight with urethane caulk.

3.09 SEALING AND FIRESTOPPING

A. Fire and Smoke Rated Penetrations:

1. Install approved product in accordance with manufacturer's instructions where pipes penetrate fire and smoke rated surface.
2. When pipe is insulated, use product which maintains integrity of insulation and vapor barrier.
3. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming.
4. Firestop mortar alone is not adequate to support any substantial weight.
5. Reference Division 07 – Firestopping.

B. Non-Rated Partitions:

1. In exterior wall openings below grade, assemble rubber links of mechanical seal to proper size for pipe and tighten in place, in accordance with manufacturer's instructions.
2. At interior partitions and exterior walls, pipe penetrations are required to be sealed.
3. Apply sealant to both sides of penetration in such a manner that annular space between pipe sleeve or cored opening and pipe or insulation is completely blocked.
4. 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 as indicated on Drawings.

3.10 PROJECT CLOSEOUT

A. Contractor shall provide the following submittal data prior to final site walk-through review.

B. Closeout Data Submittals:

1. Record Drawing submission.
2. Air and water balance test reports.

- 1 3. Operating and maintenance manuals.
- 2 4. Instructional walk-through and training.
- 3 5. Piping and valve charts.
- 4 6. Inspector's test reports as follows:
- 5 a. Fire department inspector.
- 6 b. HVAC inspector.
- 7 7. Pipe Pressure test reports as follows:
- 8 a. Special systems.
- 9 b. Building hot water heating piping.
- 10 c. Refrigerant leak test.
- 11 d. Building cooling piping.
- 12 8. System startup reports:
- 13 a. Heating equipment.
- 14 b. Variable frequency devices.
- 15 c. Temperature control equipment.
- 16 9. Chemical treatment reports:
- 17 a. Hot water heating.
- 18 b. Chilled water cooling.
- 19 10. Closeout statements:
- 20 a. Work completion.
- 21 b. Warranty statements.
- 22 c. Punch list completion.
- 23

24 3.11 HVAC PAINTING

- 25
- 26 A. Reference Division 09 – Finishes for paint and coating application requirements.
- 27
- 28 B. All exposed steel support structures including all metal surfaces located [inside and] outside building,
- 29 shall be painted after installation with one coat of compatible metal primer coat and two finish coat
- 30 applications. Color shall be gray unless specified.
- 31
- 32 C. All exposed piping, including uninsulated piping located inside building, exposed to weather and exposed
- 33 piping inside building shall be painted after installation with one coat of compatible metal primer and two
- 34 finish coat applications.
- 35
- 36 D. Paint piping in accordance with the following color charts:
- 37 1. Natural Gas – Yellow
- 38 2. Chilled Water – Blue
- 39 3. Hot Water – Orange
- 40
- 41 E. Piping systems shall be clearly identified after painting with pipe markings as specified.
- 42
- 43

END OF SECTION 23 05 00

SECTION 23 05 15

PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. HVAC piping specialties for piping systems.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 23 - General-Duty Valves for HVAC Piping.
3. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
4. Section 23 07 00 - HVAC Insulation.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. ASME B31.1 – Power Piping.

B. ASTM International (ASTM):

1. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM B650 – Specification for Electrodeposited Engineering Chromium Coatings on Ferrous Substrates.

1.03 SUBMITTALS

A. Division 01 – General Requirements: Requirements for submittals.

B. Required for all items in this section and shall include materials of construction, dimensional data, ratings, capacities, ranges, pressure drop data where appropriate, and identification as referenced in this section and on Drawings.

1.04 QUALITY ASSURANCE

A. Division 01 – General Requirements: Requirements for submittals.

1.05 DESIGN CRITERIA

A. All piping specialties are to be rated for highest pressures and temperatures in respective system in accordance with ASME B31.1, but not less than 125 psig unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.01 P/T (PRESSURE/TEMPERATURE) TEST PLUGS

A. Brass plug with 1/4-inch NPT threads, EPDM or neoprene valve core, knurled cap with cap strap.

B. Use extended length plugs to clear insulated piping.

C. Adaptors shall have 1/4-inch FPT connection for standard pressure gauges.

- 1 D. Manufacturers:
 2 1. Pete's Plugs.
 3 2. Fairfax.
 4 3. Equivalent as acceptable to Engineer.

5
 6 2.02 HOSE CONNECTION CAPS

- 7
 8 A. Hose connection caps shall be pressure rated for 150 psig at 180 degrees F.
 9

10 2.03 PRESSURE GAUGES

- 11 A. Manufacturers:
 12 1. Ametek/U. S. Gauge Division.
 13 2. Ashcroft.
 14 3. Marsh.
 15 4. Taylor.
 16 5. H. O. Trerice.
 17 6. Weiss.
 18 7. Weksler.
 19 8. Equivalent as acceptable to Engineer.

- 20
 21
 22 B. Cast aluminum case of not less than 4-1/2 inches in diameter, double strength glass window, black
 23 lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from
 24 front of dial, 99 percent accuracy over middle half of scale, 98.5 percent accuracy over remainder of
 25 scale, with scale range as follows:
 26

Service	Scale Range, psig	Min. Increment, psig
Hot Water	0 - 100	1
Chilled Water	0 - 100	1
Glycol Water	0 - 100	1
Condenser Water	0 - 60	0.5
Low Pressure Steam	0 - 30	0.5
High Pressure Steam	0 - 100	1
	0 - 300	5
Fuel Oil Suction	30" VAC - 15	0.2
Fuel Oil Discharge	0 - 60	0.5

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 38
 39 C. Pressure Snubbers:
 40 1. Bronze construction, suitable for system working pressure, 1/4-inch size.
 41

- 42 D. Coil Siphons
 43 1. Bronze or steel construction, suitable for system working pressure, 1/4-inch size.
 44

- 45 E. Gauge Valves:
 46 1. Use valves as specified in Section 23 05 23 - General-Duty Valves for HVAC Piping.
 47 a. For water systems, use 1/4-inch ball valves.
 48 b. For steam systems, use 1/4-inch gate valves suitable for system working pressure.
 49

50 2.04 AIR VENTS

- 51
 52 A. Manual Key Type Vents:
 53 1. Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from
 54 system when vent is opened, rated at not less than 125 psig at 220 degrees F;
 55 2. Manufacturers:
 56 a. Bell and Gossett Model 4V.

- b. Eaton/Dole Model 9, 9B, or 14A.
- c. Equivalent as acceptable to Engineer.

B. Manual Ball Valve Vents:

- 1. Provide 1/4-inch ball valves for manual venting of air handling unit coils and where indicated elsewhere on Drawings and details.
- 2. Reference specification Section 23 05 23 – General Duty Valves for HVAC Piping.

C. Automatic Vents:

- 1. Cast iron body with nonferrous internal parts, designed to vent air automatically with float principle without allowing air to enter system, rated at not less than 125 psig at 220 degrees F.
- 2. Manufacturers:
 - a. Amtrol/Thrush Model 720.
 - b. Bell and Gossett Model 107.
 - c. Watson McDaniel Model AV813W.
 - d. Equivalent as acceptable to Engineer.

PART 3 - EXECUTION

3.01 P/T (PRESSURE/TEMPERATURE) TEST PLUGS

- A. Install in piping systems as indicated on Drawings and details.
- B. Do not insulate over test plugs.

3.02 PRESSURE GAUGES

- A. Install in locations where indicated on Drawings and details, including any gauge piping, with scale range appropriate to system operating pressures.
- B. Pressure gauges shall be readable by person standing on floor.
- C. Pressure Snubbers: Install in gauge piping for all gauges used on water services.
- D. Coil Siphons: Install in gauge piping for all gauges used on steam services.
- E. Gauge Valves: Install at each gauge location as close to main as possible and at each location where a gauge tapping is indicated.

3.03 AIR SEPARATORS

- A. Mount in hot and chilled water lines as indicated on Drawings and details.
- B. Install ball valve with hose adapter in bottom blow down connection.
- C. Open drain valve and blow down strainer after system cleaning and again after 30 days of operation.

3.04 AIR VENTS

A. Manual Key Type Vents:

- 1. Install at all high points where air may collect and not be carried by system fluid.
- 2. Use a soft Type L Copper "pigtail" so vent can be positioned for venting and collecting any water that might escape.

B. Manual Ball Valve Vents:

- 1. Install on air handling coils and where indicated elsewhere as shown on Drawings and details.

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C. Automatic Vents:

1. Install on top of air separators on systems using bladder type expansion tanks.
2. Install at other locations as indicated on Drawings and details.
3. All locations to have a ball valve installed upstream of vent for maintenance purposes.

END OF SECTION 23 05 15

SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Water system valves.
2. Low pressure steam and condensate valves.
3. Specialty valves and valve accessories.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 15 - Piping Specialties.
3. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. ASME B16.4 - Gray Iron Threaded Fittings.

B. ASTM International (ASTM):

1. ASTM A105 - Specification for Carbon Steel Forgings for Piping Applications.
2. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. ASTM A216 – Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.

C. National Fire Protection Association (NFPA):

1. NFPA 30 - Flammable and Combustible Liquids Code.

1.03 SUBMITTALS

A. Division 01 – General Requirements: Requirements for submittals.

B. Contractor shall submit a schedule of valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for valves used on project. Temperature ratings specified are for continuous operation.

1.04 DESIGN CRITERIA

A. Where valves are specified for individual mechanical services (such as hot water heating, steam) and valves shall be of same manufacturer unless prior written approval is obtained from Engineer.

PART 2 - PRODUCTS

2.01 WATER SYSTEM VALVES

A. Water system valves shall be rated at not less than 125 psig water working pressure at 240 degrees F, unless noted otherwise.

B. Ball Valves:

1. 2-Inch and Smaller:
 - a. Two piece bronze body; threaded or soldered ends, as appropriate to pipe material;

1 stainless steel or chrome plated brass/bronze ball; conventional port; glass filled teflon seat;
2 threaded packing gland follower; blowout-proof stem; 600 psig WOG.

3 b. Valve stems shall allow operators to clear insulation without interference. Provide stem
4 extensions when valve operators interfere with pipe insulation.

5 c. Manufacturers:

6 i. Apollo 70-100/200 Series.

7 ii. Hammond 8301/8311.

8 iii. Milwaukee BA100/150.

9 iv. Nibco T/S 585-70.

10 v. Stockham S206/216.

11 vi. Equivalent as acceptable to Engineer.

12
13 C. Balance Valves:

14 1. 2-Inch and Smaller:

15 a. Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement,
16 integral pointer and calibrated scale to register degree of valve opening, memory stop,
17 drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder
18 pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200
19 psig water working pressure at 250 degrees F.

20 2. Manufacturers:

21 a. Armstrong CBV.

22 b. Bell & Gossett Circuit Setter Plus.

23 c. Griswald Quickset.

24 d. Illinois 6000 Series.

25 e. Nexus Orturi.

26 f. Nibco 1710 Series.

27 g. Taco Accu-Flo.

28 h. Tour & Anderson STAS/STAD.

29 i. Victaulic series 786/787.

30 j. Equivalent as acceptable to Engineer.

31 3. Include one bellows type differential pressure meter kit that includes a 6-inch diameter gauge with
32 270-degree arc readout and having accuracy of +/- 1 percent of full scale or better and suitable for
33 differential pressures of valves supplied for this project.

34 4. Provide over-range protection, color coded hoses not less than ten feet in length with brass
35 connectors suitable for connection to low and high pressure connections on balance valves,
36 instrument valving so meter can be vented and drained, and pressure and temperature rating at
37 least equal to that of valves.

38 5. Provide meter and accessories in a durable case with carrying handle.

39 a. Manufacturers:

40 i. Barton 247A.

41 ii. Midwest 809.

42 iii. Equivalent as acceptable to Engineer.

43 6. 2-1/2-Inch and Larger:

44 a. Use butterfly valves as specified in this section along with a flow sensing device as
45 specified in Section 23 05 15 – Piping Specialties.

46 7. 2-1/2 Inch and 3 Inch:

47 a. Bell & Gossett Circuit Setter Model CB;

48 i. Cast iron body with brass ball, integral pointer and calibrated scale to register
49 degree of valve opening, adjustable memory stop 1/4 inch NPT drain tapping,
50 flanged ends, integral brass pressure taps with check valves and EPT inserts.

51 ii. Valve shall be rated for 175 psig working water pressure at 250 degrees F.

52 b. Nibco Model 737, Globe Style Valve;

53 i. Cast iron body, with calibrated scale to register degree of valve opening, adjustable
54 memory stop, two integral metering test ports with internal check valve and caps.

55 ii. Valve shall be rated for 175 psig working water pressure at 250 degrees F.

56 8. 4 Inches and Larger (Pipe Line):

- 1 a. Use butterfly valves as specified in this section along with flow metering device PTFM-1.
2 9. 4 Inches to 8 Inches (Pump Discharge Only)
3 a. Bell & Gossett Circuit Setter Model CB;
4 i. Cast iron body and bonnet with bronze seat, replaceable bronze disc with EPDM
5 insert, stainless steel stem, teflon-graphite packing, integral pointer and calibrated
6 scale to register degree of valve opening, adjustable memory stop, flanged ends,
7 integral brass pressure taps with check valves and EPT inserts.
8 ii. Valve shall be rated for 175 psig working water pressure at 250 degrees F.
9
- 10 D. Drain Valves:
11 1. Use 3/4-inch ball valve with threaded hose adapter except strainer blow down valves to be same
12 size as blow down connection.
13
- 14 E. Combination Shut-Off, Check, and Balance Valves:
15 1. 2-Inch and Larger:
16 a. Cast or ductile iron body, threaded or flanged or grooved end connections, stainless steel
17 spring, bronze disc with EPDM seat, calibrated memory stop, backseating valve stem, inlet
18 and outlet pressure tappings, capable of being repacked under full line pressure, and
19 suitable for a minimum working pressure of 175 psig at 240 degrees F when used in hot
20 water heating systems.
21 b. Manufacturers:
22 i. Armstrong Flo-Trex.
23 ii. Bell & Gossett Triple Duty.
24 iii. Taco Multi Purpose Valve.
25 iv. Thrush-Amtrol Tri-Flow.
26 v. Equivalent as acceptable to Engineer.
27 c. Tri-Service Valve Assembly: Combination shut-off, throttling and non-slam check valve.
28 Vic-300 MasterSeal butterfly valve with memory stop feature assembled with Series 716 or
29 Style 779 Venturi Check. Series 779 check valve with venturi like taps for flow
30 measurement. Working pressures to 300 psig. Valves 14 - 24-inch: Victaulic AGS-Vic300
31 butterfly valve with gear operator and memory stop feature assembled with Series W715
32 Check Valve. Working pressures to 232 psig.
33

34 PART 3 - EXECUTION

35 3.01 GENERAL

- 36 A. Properly align piping before installation of valves in an upright position; operators installed below valves
37 will not be accepted.
38 B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not
39 support weight of piping system on valve ends.
40 C. Install temperature control valves.
41 D. Install valves with stem in upright position.
42 E. Contractor may install valves with stem in horizontal position only where space limitations do not allow
43 installation in an upright position or where providing large valves with chain wheel operators.
44 F. Where valves 2-1/2-inch and larger are located more than 12'-0" above mechanical room floors, install
45 valve with stem in horizontal position and provide a chain wheel operator. Valves installed with stems
46 down, will not be accepted.
47 G. Install stem extensions when shipped loose from valve.
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1 H. Prior to flushing of piping systems, place valves in full-open position.

2

3 3.02 SHUT-OFF VALVES

4

5 A. Install shut-off valves at equipment, at each branch take-off from mains, and at each automatic valve for
6 isolation or repair.

7

8 B. Water System:

9 1. Butterfly valves installed at location of a flow sensing device are to have a memory stop.

10

11 C. High Pressure Steam/Condensate (Over 15 psig):

12 1. Install pressure equalization/warm up bypass line with a globe valve around main steam shut-off
13 gate and butterfly valves 4-inch and larger.

14 2. Provide bypass gate valve as specified in Part 2 above to meet requirements of operating pressure
15 and temperature of high pressure steam line.

16 3. Provide bypasses sizes according to the following table:

17

Valve Size	Bypass/Gate Valve Size
<u>(inches)</u>	<u>(inches)</u>
4 thru 8	3/4
10	1
12	1
14	1-1/4
16	1-1/4

25

26 4. Bypass lines shall be made with weldolet taps at top centerline of steam main line on each side of
27 shut-off valve and with line completely above elevation of top of main steam shut-off valve.

28 5. Bypass line piping shall be ASTM Type F extra strong (Schedule 80) black steel pipe with ASTM
29 A126/ASME B16.4 Class 250 extra heavy cast iron threaded fittings.

30 6. Union in bypass line to be 2000 pound WOG. forged steel ground joint union.

31

32 3.03 BALANCING VALVES

33

34 A. Provide balancing valves for major equipment and at each major branch takeoff and at discharge of each
35 pump as indicated on Drawings and details.

36

37 B. Calibrated Balance Valves: Install where indicated on Drawings and details for balancing of hydronic
38 systems.

39

40 3.04 DRAIN VALVES

41

42 A. Provide drain valves for complete drainage of systems.

43

44 B. Locations of drain valves include low points of piping systems, equipment locations specified or detailed
45 including reheat coils, other locations required for drainage of systems.

46

47

48

END OF SECTION 23 05 23

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural supports.
2. Pipe hangers and supports.
3. Wood structure supports.
4. Beam clamps.
5. Concrete inserts.
6. Anchors.
7. Roof-mounted supports.
8. Equipment curbs.
9. Pipe penetrations through roof.
10. Corrosive atmosphere coatings.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern Work under this Section.
2. Section 23 07 00 - HVAC Insulation.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
3. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

B. Manufacturers Standardization Society (MSS):

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

1.03 DESCRIPTION

- A. Provide supporting devices as required for installation of mechanical equipment and materials.
- B. Supports and installation procedures are to conform to latest requirements of ANSI Code for pressure piping.
- C. Do not hang any mechanical item directly from a metal deck or run piping so it rests on bottom chord of any truss or joist.
- D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
- E. Protect insulation at all hanger points.

1.04 SUBMITTALS

- A. Division 01 – General Requirements: Requirements for submittals.

- 1
2 B. Submit schedule of all hanger and support devices indicating shields, attachment methods, and type of
3 device for each pipe size and type of service. Reference Section 23 05 00 – Basic HVAC Requirements.
4

5 1.05 DESIGN CRITERIA
6

- 7 A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard
8 Practice SP-58 unless noted otherwise.
9
10 B. Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to
11 have vibration isolation supports for distance of one hundred pipe diameters or three supports away from
12 equipment, whichever is greater.
13
14 C. Standard pipe hangers and supports as specified in this section are required beyond 100 pipe diameter/3
15 support distance.
16
17 D. Piping flexible connections and vibration isolation supports are required for piping connected to coils that
18 are in a fan assembly where entire assembly is mounted on vibration supports.
19
20 E. Vibration isolation supports are required for a distance of one hundred pipe diameters or three supports
21 away from equipment, whichever is greater.
22
23 F. Piping flexible connection and vibration isolation supports are not required when fan section is separately
24 and independently isolated by means of vibration supports and duct flexible connections.
25
26 G. Standard pipe hangers/supports as specified in this section are required when there are no vibration
27 isolation devices in piping and beyond 100 pipe diameter/3 support distance.
28
29 H. Piping supported by laying on bottom chord of joists or trusses will not be accepted.
30
31 I. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.
32
33 J. Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine
34 maintenance, and the like.
35

36 PART 2 - PRODUCTS
37

38 2.01 PIPE HANGER AND SUPPORT MANUFACTURERS
39

- 40 A. Manufacturers:
41 1. B-Line.
42 2. Fee and Mason.
43 3. Anvil.
44 4. Kindorf.
45 5. Michigan Hanger.
46 6. Unistrut.
47 7. Equivalent as acceptable to Engineer.
48
49 B. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.
50

51 2.02 STRUCTURAL SUPPORTS
52

- 53 A. Provide all supporting steel required for installation of mechanical equipment and materials, whether or
54 not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support
55 tanks and equipment.
56

1 2.03 PIPE HANGERS AND SUPPORTS

- 2
- 3 A. Hangers for Steel Pipe Sizes 1/2-Inch through 2-Inch:
- 4 1. MSS SP-58 Type 1, carbon steel, adjustable, clevis, black finish.
- 5 2. Provide Anvil Figure 260.
- 6
- 7 B. Hangers for Steel Pipe Sizes 2-1/2 Inch and Over (for systems 200 degrees F or less):
- 8 1. MSS SP-58, Type 1, carbon steel, adjustable, clevis, black finish.
- 9 2. Provide Anvil Figure 260.
- 10
- 11 C. Hangers for Steel Pipe Sizes 2-1/2-Inch and Over (for systems 200 degrees F or greater):
- 12 1. MSS SP-58, Type 43 carbon steel, adjustable, clevis, black finish; or adjustable steel yoke, cast
- 13 iron roll, double hanger.
- 14 2. Provide Anvil Figure 181.
- 15
- 16 D. Multiple or Trapeze Hangers:
- 17 1. Steel channels with welded spacers and hanger rods if calculations are submitted.
- 18
- 19 E. Wall Support:
- 20 1. MSS SP-58, type 31, welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series or
- 21 equivalent as acceptable to Engineer.
- 22 2. Perforated epoxy painted finish, 16-12-gauge minimum, steel channels securely anchored to wall
- 23 structure with interlocking, split type, bolt secured, galvanized pipe/tubing clamps.
- 24 3. B-Line Type S channel with B-2000 Series clamps, Anvil Type PS200 H with PS 1200 clamps or
- 25 equivalent as acceptable to Engineer.
- 26 4. When copper piping is being supported, provide flexible elastomeric / thermoplastic isolation
- 27 cushion material to completely encircle piping and avoid contact with channel or clamp, B-Line
- 28 B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT
- 29 Series, Anvil Cushion clamp assembly.
- 30
- 31 F. Copper Pipe Support:
- 32 1. Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.
- 33
- 34 G. Insulation Protection Shields:
- 35 1. MSS SP-58, Type 40, galvanized carbon steel of not less than 18-gauge for use on insulated pipe
- 36 2-1/2-inch and larger.
- 37 2. Minimum shield length is 12 inches.
- 38 3. Anvil Figure 167.
- 39
- 40 H. Steel Hanger Rods:
- 41 1. Threaded ends, threaded one end, or continuous threaded.
- 42 2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
- 43 3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to
- 44 exceed limits indicated.

Maximum Load (Lbs.) (650 Degrees F Maximum Temp.)	Rod Diameter (inches)
--	--------------------------

610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

1 4. Provide rods complete with adjusting and lock nuts.

2
3 2.04 BEAM CLAMPS

4
5 A. MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for
6 single threaded rods of 3/8, 1/2, and 5/8-inch diameter, for use with pipe sizes 4-inch and less. Furnish
7 with hardened steel cup point set screw. Anvil Figure 86.

8
9 B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with tie rod to lock clamp in place, suitable
10 for rod sizes to 1-1/2-inch diameter but limited in application to pipe sizes 8-inch and less without prior
11 approval. Anvil Figure 228.

12
13 2.05 ANCHORS

14
15 A. Use welding steel shapes, plates, and bars to secure piping to structure.

16
17 PART 3 - EXECUTION

18
19 3.01 INSTALLATION

20
21 A. Install supports to provide for free expansion of piping and duct system.

22
23 B. Support piping from structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor
24 stands.

25
26 C. Fasten ceiling plates and wall brackets securely to structure and test to demonstrate adequacy of
27 fastening.

28
29 D. Coordinate hanger and support installation to properly group piping of all trades.

30
31 E. Where piping can be conveniently grouped to allow use of trapeze type supports, use standard structural
32 shapes or continuous insert channels for supporting steel.

33
34 F. Perform welding in accordance with standards of American Welding Society.

35
36 G. Clean surfaces of loose scale, rust, paint, or other foreign matter and properly align before welding.

37
38 H. Use wire brush on welds after welding.

39
40 I. Welds shall show uniform section, smoothness of weld metal, and freedom from porosity and clinkers.

41
42 J. Where necessary to achieve smooth connections, joints shall be dressed smooth.

43
44 K. Utilize roller type hangers and supports for piping 3 inches and larger on systems with operating
45 temperature of 140 degrees F or greater.

46
47 3.02 HANGER AND SUPPORT SPACING

48
49 A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

50
51 B. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze
52 hangers.

53
54 C. Support riser piping independently of connected horizontal piping.

55
56 D. Adjust hangers to obtain slope specified in piping section of this specification.

1
2
3
4
5
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9
10
11
12
13
14

E. Space hangers for pipe as follows:

<u>Pipe Material</u>	<u>Pipe Size (inches)</u>	<u>Maximum Spacing</u>
Steel	1/2 through 1-1/4	6'-6"
Steel	1-1/2 through 6	10'-0"
Steel	8 through 12	14'-0"
Steel	14 and over	20'-0"
Thermoplastic	All sizes	6'-0"
Copper	1/2 through 1-1/4	5'-0"
Copper	1-1/2 and larger	8'-0"

END OF SECTION 23 05 29

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SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nameplates.
2. Tags.
3. Stencils.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern Work under this Section.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. Division 01 – General Requirements: Requirements for submittals.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 IDENTIFICATION PRODUCTS

A. Manufacturers:

1. Seton Identification Products.
2. Brady Corporation
3. Champion America.
4. Equivalent as acceptable to Engineer.

2.02 COMPONENTS

A. Nameplates:

1. Laminated three-layer plastic with engraved black letters on white contrasting background color.

B. Plastic Tags:

1. Laminated three-layer plastic with engraved black letters on white contrasting background color. Tag size minimum 1-1/2 inches diameter.

C. Metal Tags:

1. Brass with stamped letters' tag size minimum 1-1/2 inches diameter with smooth edges.

D. Information Tags:

1. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

- E. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inch Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1 inch high letters.
 - 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
 - 4. Ductwork and Equipment: 1-3/4 inches high letters.
- F. Stencil Paint: As specified in Article 9, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Article 9.5 for stencil painting.

3.02 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- D. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.
- F. Apply stencil painting in accordance with manufacturer's instruction.
- G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates.
- H. Small devices, such as in-line pumps, may be identified with tags.
- I. Identify control panels and major control components outside panels with plastic nameplates.
- J. Identify valves in main and branch piping with tags.
- K. Identify air terminal units and radiator valves with numbered tags.
- L. Tag automatic controls, instruments, and relays. Key to control schematic.
- M. Identify piping, concealed or exposed, with plastic pipe markers.
- N. Identify service, flow direction, and pressure.
- O. Install in clear view and align with axis of piping.
- P. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- Q. Identify ductwork with plastic nameplates. Identify with air handling unit identification number and area served.

1 R. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each
2 obstruction.
3

END OF SECTION 23 05 53

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Air and water systems testing, adjusting and balancing.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC):
 - a. HVAC Shop Drawings to be given to test and balance agency and for coordination between Division 23 Contractor and firm performing the work in this section.
 - b. Drawings and specifications which define scope of systems to be balanced. Reference to construction bulletins for proposed changes and to change orders for changes that have been accepted.
3. Division 26 – Electrical:
 - a. Electrical drawings and specifications which define scope of electrical systems that serve mechanical equipment.

1.02 REFERENCES

A. Associated Air Balance Council (AABC):

1. AABC - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Current Edition.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

1. ASHRAE Handbook, HVAC Applications - Testing Adjusting and Balancing, Current Edition.

C. National Environmental Balancing Bureau (NEBB):

1. NEBB - Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Current Edition.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. An independent firm specializing in the testing and balancing of HVAC systems for a minimum of three (3) years.
2. 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 installed testing and balancing components necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.

B. A certified member of AABC or certified by NEBB in the specific area of work performed. Maintain certification for the entire duration of project.

C. If certification of firm or any staff performing work is terminated or expires during the duration of project, contact Owner's Representative immediately.

D. Technicians on this project must have satisfactorily completed work on a minimum of three (3) projects of at least 50 percent in size, and of similar complexity.

1 E. Submit Qualifications of firm and project staff to Engineer/Architect upon request.

2
3 1.04 PRE-INSTALLATION MEETING AND SCHEDULING

4
5 A. Test and balance agency shall be required to attend a pre-installation meeting with other project
6 Contractors before construction process is started.

7
8 B. Test and balance agency shall provide input on time requirements for work required in this section.
9

10 1.05 PRE-BALANCE MEETING

11
12 A. Four weeks prior to beginning testing, adjusting and balancing, schedule and conduct a meeting with
13 Construction Manager, Owner's Representative, and mechanical system and temperature control system
14 installing Contractors.

15
16 B. The objective is final coordination and verification of system operation and readiness for testing,
17 adjusting and balancing procedures and scheduling procedures with above mentioned parties.
18

19 C. Indicate work required to be completed prior to testing, adjusting, and balancing and identify party
20 responsible for completion of that work.
21

22 1.06 SUBMITTALS

23
24 A. Division 01 – General Requirements: Requirements for submittals.
25

26 B. Submit testing, adjusting and balancing reports bearing seal and signature of NEBB or AABC Certified
27 Test and Balance Supervisor.
28

29 C. Reports to be certified proof that systems have been tested, adjusted and balanced in accordance with
30 referenced standards; are an accurate representation of how systems have been installed and are
31 operating; and are an accurate record of final quantities measured to establish normal operating values of
32 systems.
33

34 D. Submit reports in electronic format. If information is incomplete or further testing, adjusting and
35 balancing is deemed necessary, resubmit complete sets.
36

37 E. Divide contents of report into below listed divisions:

- 38 1. General information.
- 39 2. Summary.
- 40 3. Air systems.
- 41 4. Hydronic systems.
- 42 5. Special systems.
43

44 F. Contents: Provide the following minimum information, forms and data:

45 1. General Information:

- 46 a. Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer,
47 Construction Manager, Project Name, and Project Number.
- 48 b. Include addresses, contact names and telephone numbers.
- 49 c. Also include a certification sheet containing seal and signature of Test and Balance
50 Supervisor.
51

52 2. Summary:

- 53 a. Provide summary sheet describing mechanical system deficiencies.
- 54 b. Describe objectionable noise or drafts found during testing, adjusting, and balancing.
- 55 c. Provide recommendations for correcting unsatisfactory performances and indicate whether
56 modifications required are within scope of the contract, are design related or installation
related.

- 1 d. List instrumentation used during testing, adjusting and balancing procedures.
2 3. Remainder of report to contain appropriate standard NEBB or AABC forms for each respective
3 item and system. Fill out forms completely. Where information cannot be obtained or is not
4 applicable indicate same.
5

6 1.07 TESTING, ADJUSTING AND BALANCING REQUIREMENTS
7

- 8 A. Provide total mechanical systems testing, adjusting and balancing. Requirements include balance of air
9 and water distribution, adjustment of new and existing systems to provide design quantities indicated on
10 Drawings, electrical measurement and verification of performance of all equipment, all in accordance
11 with standards published by AABC or NEBB.
12
13 B. Balancing work shall be performed by an AABC or NEBB certified air balance agency. Certification
14 number and seal of registration shall be included with each balancing report.
15
16 C. Test, adjust and balance all air and hydronic systems so that each room, piece of equipment or terminal
17 device is using quantities indicated on Drawings and in specifications.
18
19 D. Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of
20 major buildings, occupancy of one building when project involves many buildings, and completion of
21 entire project in time stated in Instruction to Bidders and in accordance with completion schedule
22 established for this project.
23
24 E. Test and balance agency is encouraged to make periodic site visits to make sure that provisions are being
25 made to accomplish specified testing, adjusting and balancing work.
26

27 PART 2 - PRODUCTS
28

29 2.01 INSTRUMENTATION
30

- 31 A. Provide required instrumentation to obtain proper measurements.
32
33 B. Application of instruments and accuracy of instruments and measurements to be in accordance with
34 requirements of NEBB or AABC Standards and instrument manufacturer's specifications.
35
36 C. Instruments used for measurements shall be accurate, and calibration histories for each instrument to be
37 available for examination by Owner upon request.
38
39 D. Calibration and maintenance of all instruments to be in accordance with requirements of NEBB or AABC
40 Standards.
41

42 PART 3 - EXECUTION
43

44 3.01 PRELIMINARY PROCEDURES
45

- 46 A. Obtain preconstruction meeting report, applicable construction bulletins, applicable change orders, and
47 approved Shop Drawings of equipment, outlets/inlets, and temperature controls.
48
49 B. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation
50 and belt tension, temperature controls for completion of installation and hydronic systems for proper
51 charge and purging of air.
52
53 C. Notify Construction Manager on a daily basis during balancing.
54
55 D. Identify deficiencies preventing completion of testing, adjusting, and balancing procedures. Do not
56 proceed until systems are fully operational with components necessary for complete testing, adjusting,

1 and balancing.

- 2
3 E. Installing Contractors are required to provide personnel to check and verify system completion, readiness
4 for balancing, and assist Balancing Agency in providing specified system performance.
5

6 3.02 PERFORMING TESTING, ADJUSTING AND BALANCING
7

- 8 A. Perform testing, adjusting, and balancing procedures on each system identified, in accordance with
9 detailed procedures outlined in referenced standards except as may be modified below.
10

- 11 B. Unless specifically instructed in writing, all work in this specification section is to be performed during
12 normal workday.
13

- 14 C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is
15 complete and provide new tile for any tile that are damaged by this procedure.
16

- 17 D. If ceiling construction is such that access panels are required for the work of this section and panels have
18 not been provided, inform Construction Manager.
19

- 20 E. Cut insulation, ductwork and piping for installation of test probes to minimum extent necessary for
21 adequate performance of procedures.
22

- 23 F. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating
24 of systems.
25

- 26 G. In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway
27 between that of a clean filter and that of a dirty filter.
28

- 29 H. Measure and record system measurements at fan and pump to determine total flow.
30

- 31 I. Adjust equipment as required to yield specified total flow at terminals.
32

- 33 J. Proceed taking measurements in mains and branches as required for final terminal balancing.
34

- 35 K. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors, and
36 valves prior to adjustment of terminals.
37

- 38 L. Measure and record static air pressure conditions across fans, coils and filters.
39

- 40 M. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements
41 were made on a clean or dirty filter.
42

- 43 N. Spot check static air pressure conditions directly ahead of terminal units.
44

- 45 O. Determine air handling system total supply and return airflow and return and exhaust fan total airflow at
46 each piece of equipment utilizing a pitot tube duct traverse.
47

- 48 P. Summation of air terminal inlet/outlet CFM's is not acceptable, unless a pitot tube traverse is impractical.
49

- 50 Q. If summation of the air inlets/outlets is used in lieu of traverse method, a valid explanation shall be
51 submitted along with balancing reports.
52

- 53 R. Insufficient back-up information to support use of summation method is cause for rejection of balancing
54 reports without review.
55

- 56 S. Submit a static pressure profile for each air handling unit system.

- 1
2 T. Unit static pressure profile shall be done at both minimum outside air CFM and at maximum outside air
3 CFM (full economizer cycle) and also with face and bypass dampers (when provided on air handling
4 systems) in full bypass position as well as full face position.
5
6 U. Reports submitted without air handling system static pressure profiles is cause for rejection of balancing
7 reports without review.
8
9 V. Adjust outside air, return air, and relief air dampers for design conditions at both minimum and maximum
10 settings and record both sets of data.
11
12 W. Balance modulating dampers at extreme conditions and record both sets of data.
13
14 X. Balance variable air volume systems at maximum air flow rate, full cooling, and minimum flow rate, full
15 heating; and record data.
16
17 Y. Adjust register, grille, and diffuser vanes and accessories to achieve proper air distribution patterns and
18 uniform space temperatures free from objectionable noise and drafts within capabilities of installed
19 system.
20
21 Z. Provide fan and motor drive sheave adjustments necessary to obtain design performance.
22
23 AA. Include in scope of services drive changes specifically noted on Drawings, if any.
24
25 BB. If work of this section indicates that any drive or motor is inadequate for application, advise Construction
26 Manager by giving properly sized motor and drive information [in accordance with manufacturers
27 original service factor and installed motor horsepower requirements].
28
29 CC. Verify that any change will keep duct and piping system within its design limitations with respect speed
30 of device and pressure classification of distribution system.
31
32 DD. Time and material for motor/drive changes will be considered a reimbursable expense and will require an
33 itemized cost breakdown of all time and drive changes submitted to Construction Manager; prior
34 authorization is needed before this work is started.
35
36 EE. Areas or rooms designed to maintain positive, negative, or balanced air pressures with respect to adjacent
37 spaces, as indicated by design air quantities, require special attention.
38
39 FF. Adjust fan drives, distribution dampers, terminals, and controls to maintain indicated pressure
40 relationship.
41
42 GG. Final air system measurements to be within the following range of specified cfm:
43 1. Fans: -5 percent to +10 percent.
44 2. Supply grilles, registers, diffusers: -5 percent to +10 percent.
45 3. Return/exhaust grilles, registers: +5 percent to -10 percent
46 4. Room pressurization air: -5 to +5 percent.
47 5. [Supply grilles, registers, diffusers in operating rooms, procedure rooms, isolation rooms and
48 similar hospital spaces requiring a pressure differential: 0 percent to +10 percent.]
49 6. [Return/exhaust grilles, registers in operating rooms, procedure rooms and similar hospital spaces
50 requiring a pressure differential: 0 percent to -10 percent.]
51 7. [Exhaust grilles and registers in isolation rooms and similar hospital spaces requiring a negative
52 pressure differential: 0 percent to +10 percent.]
53
54 HH. Final water system measurements must be within the following range of specified gpm:
55 1. Heating Flow Rates: 0 percent to +10 percent.
56 2. Cooling Flow Rates: -5 percent to +5 percent.

- 1
- 2 II. Contact Temperature Control Contractor for assistance in operation and adjustment of controls during
- 3 testing, adjusting, and balancing procedures.
- 4
- 5 JJ. Cycle controls and verify proper operation and setpoints. Include in report description of temperature
- 6 control operation and any deficiencies found.
- 7
- 8 KK. Permanently mark equipment settings, including damper and valve positions, control settings, and similar
- 9 devices allowing settings to be restored. Set and lock memory stops.
- 10
- 11 LL. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes,
- 12 and restoring temperature controls to normal operating settings.
- 13
- 14 MM. Coordinate and assist CxP with verification activities defined within Commissioning specifications,
- 15 including providing all sampling data necessary for the Commissioning process.
- 16
- 17 NN. Verify and record, in the T&B Report, “K” factors for all VAV air terminal devices and air flow stations.
- 18
- 19 OO. Coordinate air handling unit minimum outside air set points with the Temperature Control Contractor.
- 20
- 21 PP. [Coordinate Fume Hood Monitor calibration with the Fume Hood Manufacturer.]
- 22

23 3.03 VAV SUPPLY AND EXHAUST DUCT SYSTEM STATIC PRESSURE SET POINT

- 24
- 25 A. For VAV supply and exhaust systems with VAV air terminal devices, determine minimum required duct
- 26 static pressure at DDC static pressure sensor (location(s) needed to insure that all VAV air terminals are
- 27 operating at their design airflows with the most demanding VAV terminal wide open.
- 28
- 29 B. Provide these static pressure numbers to DDC temperature controls contractor and record them in T& B
- 30 report for each system.
- 31

32 3.04 HYDRONIC SYSTEM DIFFERENTIAL, PRESSURE CONTROL SET POINT

- 33
- 34 A. For hydronic systems with variable speed pumping, determine minimum required system differential
- 35 pressure set point needed to insure that all terminal devices are operating at their design water flows with
- 36 the most demanding terminals device control valve wide open.
- 37
- 38 B. Provide differential control setting set point to DDC temperature controls contractor and record them in
- 39 T&B report for each system.
- 40

41 3.05 CRITICAL ROOM PRESSURE RELATIONSHIPS

- 42
- 43 A. For the following rooms, pressure relationship between room and adjacent space or corridor is critical.
- 44
- 45 B. After air balancing in room is complete, measure and record in T&B report static pressure between room
- 46 listed and adjacent corridor/room.
- 47
- 48 C. Inform Engineer/Architect of all instances where pressure relationship does not match what is indicated
- 49 in this schedule.
- 50

51 3.06 HYDRONIC SYSTEMS

- 52
- 53 A. For HVAC pumps 10 horsepower or less, valve throttling alone may not be used for hydronic system
- 54 balancing.
- 55
- 56 B. Throttling of triple-duty valves shall not exceed 50 percent closed. Where additional throttling would be

1 necessary to achieve system design flow, impellor shall be trimmed.
2

- 3 C. Verify triple-duty valve utilized on systems with Variable Frequency Drives are 100 percent open when
4 balancing work is complete.
- 5
- 6 D. Pressure drop across triple-duty valves shall not exceed 25 feet w.g. Where additional throttling would
7 be necessary to achieve system design flow, impellor shall be trimmed.
8
- 9 E. For HVAC pumps greater than 10 horsepower through 60 horsepower, trim impellor where valve
10 throttling will result in a draw that exceeds 3 horsepower.
- 11
- 12 F. For HVAC pumps larger than 60 horsepower, trim impellor where valve throttling results in a
13 horsepower draw that exceeds 5 percent of pump motor horsepower rating.
- 14
- 15 G. Future fouling of an open piping system may be considered when determining impellor trim
16 requirements.
- 17
- 18 H. Verify butterfly valves utilized for hydronic system balancing are provided with position-lock operators
19 (memory stops) in accordance with Section 23 05 23 – General Duty Valves for HVAC Piping.
- 20
- 21 I. Adjustment and marking of lever-lock operators that use throttling notches will not be accepted.
- 22
- 23 J. Lock all memory stops so valves can be reopened to their balanced positions if they are used for isolation
24 purposes.
- 25

26 3.07 DEFICIENCIES

- 27
- 28 A. Mechanical Contractor to correct any installation deficiencies found by test and balance agency that were
29 specified and shown on Contract Documents to be performed as part of that division of work.
- 30
- 31 B. Test and balance agency shall notify Construction Manager of these items and instructions will be issued
32 to Mechanical Contractor for correction of deficient work.
- 33
- 34 C. Corrective work to be done at no cost to Owner.
- 35
- 36 D. Retest mechanical systems, equipment, and devices after corrective work is completed as specified.
- 37

38 END OF SECTION 23 05 93

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SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes insulation for heating, ventilating and air conditioning piping, ductwork and equipment.
- B. Related Sections:
 - 1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
 - 2. Section 23 05 00 - Basic HVAC Requirements.
 - 3. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - 4. Section 23 21 13 - Hydronic Piping.
 - 5. Section 23 31 00 - HVAC Ducts and Casings.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM B209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - 2. ASTM C165 - Test Method for Compressive Properties of Thermal Insulations.
 - 3. ASTM C177 – Test Method for Heat Flux and Thermal Transmission Properties.
 - 4. ASTM C195 - Specification for Mineral Fiber Thermal Insulation Cement.
 - 5. ASTM C240 - Specification for Cellular Glass Insulation Block.
 - 6. ASTM C302 - Test Method for Density of Preformed Pipe Insulation.
 - 7. ASTM C303 - Test Method for Density of Preformed Block Insulation.
 - 8. ASTM C411 – Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - 9. ASTM C449 - Specification for Mineral Fiber Hydraulic Setting Thermal Insulation Cement.
 - 10. ASTM C518 - Test Method for Heat Flux and Thermal Transmission Properties.
 - 11. ASTM C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - 12. ASTM C534 - Specification for Preformed Flexible Elastomeric Thermal Insulation.
 - 13. ASTM C547 - Specification for Mineral Fiber Preformed Pipe Insulation.
 - 14. ASTM C552 - Specification for Cellular Glass Block and Pipe Thermal Insulation.
 - 15. ASTM C553 - Specification for Mineral Fiber Blanket and Felt Insulation.
 - 16. ASTM C578 - Specification for Preformed, Block Type Cellular Polystyrene Thermal Insulation.
 - 17. ASTM C591 - Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - 18. ASTM C610 - Specification for Expanded Perlite Block and Thermal Pipe Insulation.
 - 19. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 20. ASTM C916 - [Specification for Adhesives for Duct Thermal Insulation](#).
 - 21. ASTM C921 – Practice for Determining Properties of Jacketing Materials for Thermal Insulation.
 - 22. ASTM C1071 – Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - 23. ASTM C1136 - Specification for Flexible Low Permeance Vapor Retarders for Thermal Insulation.
 - 24. ASTM C1338 – [Test Method for Determining Fungi Resistance of Insulation Materials and Facings](#).
 - 25. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 26. ASTM D1000 – Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.
 - 27. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 28. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

- 1 29. ASTM D1940 – Method of Test for Porosity of Rigid Cellular Plastics.
2 30. ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and
3 Humid Aging.
4 31. ASTM D2240 – Standard Test Method for Rubber Property-Durometer Hardness.
5 32. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
6 33. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
7 34. ASTM E814 – Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
8 35. ASTM E2336 – Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.
9 36. ASTM G21 - Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

10
11 B. Midwest Insulation Contractors Association (MICA):

- 12 1. MICA - National Commercial & Industrial Insulation Standards.
13

14 C. National Fire Protection Association (NFPA):

- 15 1. NFPA 225 - Surface Burning Characteristics of Building Materials.
16

17 D. Underwriters Laboratories, Inc. (UL):

- 18 1. UL 723 - Surface Burning Characteristics of Building Materials.
19

20 1.03 QUALITY ASSURANCE

21 A. Substitutions: In accordance with Division 01 – General Requirements.
22

23 B. Label insulating products delivered to construction site with manufacturer's name and description of
24 materials.
25
26

27 1.04 DESCRIPTION

28 A. Furnish and install insulating materials and accessories as specified or as required for a complete
29 installation. Following types of insulation are specified in this section:

- 30 1. Pipe insulation.
31 2. Duct insulation.
32 3. Equipment insulation.
33
34

35 B. Install insulation in accordance with latest edition of MICA standard and manufacturer's installation
36 instructions.
37

38 C. Exceptions to these standards will only be accepted where specifically modified in these specifications, or
39 where prior written approval has been obtained from Engineer/Architect.
40

41 1.05 DEFINITIONS

42 A. Concealed: Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All
43 other areas, including walk-through tunnels, shall be considered as exposed.
44
45

46 B. Exposed to Weather: Ducts located outdoors, either on grade, on a wall, or on a roof, in a location where
47 sun, wind, rain snow, and other elements will come in contact with ductwork.
48

49 C. Unconditioned Spaces: Unheated or non-cooled attics, utility tunnels and crawl spaces where ambient
50 temperatures may rise above 90 degrees F, or drop below 50 degrees F. Ducts in these instances are
51 considered to be located outside of building thermal envelope.
52

53 1.06 SUBMITTALS

54 A. Division 01 – General Requirements: Requirements for submittals.
55
56

- 1 B. Submit a schedule of all insulating materials to be used on project, including adhesives, fastening
2 methods, fitting materials along with material safety data sheets and intended use of each material.
3
- 4 C. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and
5 manufacturer's installation instructions.
6
- 7 D. Duct liner including data on thermal conductivity, air friction correction factor, and limitation on
8 temperature and velocity.
9

10 1.07 ENVIRONMENTAL REQUIREMENTS

- 11
- 12 A. Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install
13 insulation products that have been exposed to water.
14
- 15 B. Protect installed work with plastic sheeting to prevent water damage.
16

17 PART 2 - PRODUCTS

18 19 2.01 MATERIALS

- 20
- 21 A. Materials or accessories containing asbestos will not be accepted.
22
- 23 B. Use composite insulation systems, including insulation, jackets, sealants, mastics, and adhesives that have
24 flame spread rating of 25 or less and smoke developed rating of 50 or less, with following exceptions:
25 1. Pipe insulation not located in an air plenum may have a flame spread rating not over 25 and a
26 smoke developed rating no higher than 150.
27

28 2.02 INSULATION TYPES

- 29
- 30 A. Manufacturers:
31 1. Armacell.
32 2. Certainteed.
33 3. Manson.
34 4. Childers.
35 5. Dow.
36 6. Extol.
37 7. Fibrex.
38 8. H.B. Fuller.
39 9. Imcoa.
40 10. Johns Manville.
41 11. Knauf.
42 12. Owens-Corning.
43 13. Partek.
44 14. Pittsburgh Corning.
45 15. Rubatex.
46 16. Equivalent as acceptable to Engineer.
47
- 48 B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation
49 shall be suitable to receive jackets, adhesives and coatings as indicated.
50
- 51 C. Flexible Fiberglass Insulation:
52 1. Minimum nominal density of 1.5 lbs. per cu. ft., and thermal conductivity of not more than 0.3 at
53 75 degrees F, rated for service to 250 degrees F.
54
- 55 D. Rigid Fiberglass Insulation:
56 1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at

1 75 degrees F, minimum compressive strength of 25 psf at 10 percent deformation, rated for service
2 to 450 degrees F.
3

4 E. Elastomeric Insulation:

- 5 1. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not
6 more than 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25 percent
7 deformation, maximum water vapor permeability of 0.17 perm inch, maximum water absorption
8 of 6 percent by weight, rated for service range of -20 degrees F to 220 degrees F on piping and
9 180 degrees F where adhered to equipment.

10
11 F. Polyolefin Insulation:

- 12 1. Flexible closed cell, minimum nominal density of 1.5 lbs. per cu. ft., thermal conductivity of not
13 more than 0.24 at 75 degrees F, minimum compressive strength of 5 psi at 25 percent deformation,
14 maximum water vapor permeability of 0.0 perm inch, maximum water absorption of 0 percent by
15 weight and volume, rated for service range of -165 degrees F to 210 degrees F.

16
17 G. Extruded Polystyrene Insulation:

- 18 1. Rigid closed cell, minimum nominal density of 1.6 lbs. per cu. ft., thermal conductivity of not
19 more than 0.285 at 75 degrees F, minimum compressive strength of 20 psi, maximum water vapor
20 permeability of 1.5 perm inch, maximum water absorption of 0.5 percent by volume, rated for
21 service range of -290 degrees F to 165 degrees F.
22

23 H. Polyisocyanurate Insulation:

- 24 1. Rigid closed cell polyisocyanurate, minimum nominal density of 2.0 lbs. per cu. ft., thermal
25 conductivity of not more than 0.19 at 75 degrees F aged 180 days, minimum compressive strength
26 of 24 psi parallel and 13 psi perpendicular, maximum water vapor permeability of 4 perm inch,
27 maximum water absorption of 2 percent by volume, rated for service range of -290 degrees F to
28 300 degrees F.
29

30 2.03 JACKETS

31
32 A. PVC Fitting Covers and Jackets:

- 33 1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type
34 II, Grade GU.
35 2. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet
36 radiation, in kitchens or food processing areas or installed outdoors.
37 3. Jacket thickness to be minimum 0.02-inch indoors/0.03-inch outdoors for piping 12-inch and
38 smaller, 0.03-inch indoors and 0.04-inch outdoors for piping 15-inch and larger.
39

40 B. All Service Jackets (ASJ):

- 41 1. Heavy duty, fire retardant material with white kraft reinforced foil vapor barrier, factory applied to
42 insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms
43 and minimum beach puncture resistance of 50 units.
44

45 C. Foil Scrim All Service Jackets (FSJ):

- 46 1. Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of
47 .02 perms and minimum beach puncture resistance of 25 units.
48

49 D. Protective Metal Jackets (PMJ):

- 50 1. [0.016 inch thick aluminum] [or] [0.010 inch thick stainless steel] with safety edge.
51

52 E. Self-Adhering Jackets (SAJ):

- 53 1. 5-ply, self-adhering multiple laminated waterproofing material with reflective aluminum foil, high
54 density polymer films and cold weather acrylic adhesive providing zero (0.0) permeability.
55 2. Minimum 6 mils material thickness, 35 lb. puncture resistance when tested in accordance with
56 ASTM D1000 and flame spread/smoke developed rating of 10/20 when tested in accordance with

1 UL 723.

- 2 3. Vapor retarding tape shall be specifically designed and manufactured for use with the self-
3 adhering jacket specified above.
4 4. Tape shall be provided by the same manufacturer that provides jacketing.
5 5. Vapor retarding tapes used with self-adhering jackets shall have a maximum permeance of 0.0
6 perms.
7

8 F. Fabric Reinforced Mastic Jackets (FMJ):

- 9 1. Glass fiber reinforcing fabric imbedded in weather barrier mastic as per manufacturer's
10 recommended procedure for 2 coat application.
11

12 G. Vapor Retarding Jackets (VRJ):

- 13 1. Polyvinylidene chloride (PVDC) vapor retarding jacket material with minimum 6 mils material
14 thickness and maximum permeance of 0.01 perms.
15 2. Material shall not support the growth of mold or mildew. Dow Saran or equivalent.
16 3. Vapor retarding tape shall be specifically designed and manufactured for use with the vapor
17 retarding jacket specified above.
18 4. Tape shall be provided by the same manufacturer that provides jacketing.
19 5. Vapor retarding tapes used with vapor retarding jackets shall have a maximum permeance of 0.01
20 perms.
21

22 2.04 INSULATION INSERTS AND PIPE SHIELDS
23

24 A. Manufacturers:

- 25 1. B-Line.
26 2. Pipe Shields.
27 3. Value Engineered Products.
28 4. Equivalent as acceptable to Engineer.
29

30 B. Construct inserts with calcium silicate, or polyisocyanurate for service temperatures below 300 degrees F
31 only, minimum 140 psi compressive strength.
32

33 C. Piping 12-inch and larger, supplement with high density 600 psi structural calcium silicate insert.
34

35 D. Provide galvanized steel shield.
36

37 E. Insert and shield to be minimum 180-degree coverage on bottom supported piping and full 360-degree
38 coverage on clamped piping.
39

40 F. On roller mounted piping and piping designed to slide on support, provide additional load distribution
41 steel plate.
42

43 G. Where Contractor proposes shop and site fabricated inserts and shields, submit schedule of materials,
44 thicknesses, gauges, and lengths for each pipe size to demonstrate equivalency to pre-engineered/pre-
45 manufactured product described above.
46

47 H. On low temperature systems, high-density rigid polyisocyanurate may be substituted for calcium silicate
48 provided that insert and shield length and shield gauge are increased to compensate for lower insulation
49 compressive strength.
50

51 I. Pre-compressed 20 lb. density molded fiberglass blocks, Hamfab or an approved equal, of same thickness
52 as adjacent insulation may be substituted for calcium silicate inserts with one 1 x 6-inch block for piping
53 through 2-1/2-inch and three 1 x 6-inch blocks for piping through 4-inch.
54

55 J. Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product
56 described above.

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K. Wood blocks shall be prohibited.

2.05 DUCT LINING

- A. Manufacturer:
 - 1. Johns Manville - Linatex Series.
 - 2. Owens-Corning - Quiet R.
 - 3. Certaineed - Toughgard.
 - 4. Equivalent as acceptable to Engineer.
- B. Make 1-inch thick, 3 lbs./ft.³ density flexible, mat faced insulation from inorganic glass fibers bonded with a thermosetting resin with thermal conductivity of 0.25 BTU inch/hour sq.ft. degree F.
- C. Meet erosion testing per UL 181 or ASTM C1071 for 5000 fpm maximum air velocity. ASTM C411 maximum operating temperature rating of 250 degrees F. ASTM E84 flame spread less than 25 and smoke developed less than 50.
- D. Meet requirements of ASTM C1338 and ASTM G21 for fungi resistance.
- E. Install liner using adhesive conforming to ASTM C916.

2.06 ACCESSORIES

- A. Products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of systems to which they are applied.
- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands to be 3/4-inch wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015-inch for aluminum and 0.010-inch for stainless steel.
- D. Tack fasteners to be stainless steel ring grooved shank tacks.
- E. Staples to be clinch style.
- F. Insulating cement to be ASTM C195, hydraulic setting mineral wool.
- G. Finishing cement to be ASTM C449.
- H. Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.
- I. Bedding compounds to be non-shrinking and permanently flexible.
- J. Vapor barrier coatings and tapes to have maximum applied water vapor permeance of 0.05 perms.
- K. Fungicidal water base coating, Foster 40-20 or an approved equal, to be compatible with vapor barrier coating.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install insulation, jackets and accessories in accordance with manufacturer's instructions and under ambient temperatures and conditions recommended by manufacturer.

- 1
2 B. Surfaces to be insulated must be clean and dry.
3
4 C. Do not insulate systems or equipment specified to be pressure tested or inspected, until testing,
5 inspection, and any necessary repairs have been successfully completed.
6
7 D. Install insulation with smooth and even surfaces.
8
9 E. Poorly fitted joints or use of filler in voids will not be accepted.
10
11 F. Provide neatly beveled and coated terminations at nameplates, un-insulated fittings, or at other locations
12 where insulation terminates.
13
14 G. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
15
16 H. Use full length material as delivered from manufacturer wherever possible.
17
18 I. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.
19
20 J. Insulation shall be continuous through sleeves and openings except where fire rated penetration materials
21 require interruption of insulation.
22
23 K. Maintain vapor barriers continuous through all penetrations.
24
25 L. Provide a complete vapor barrier for insulation on following systems:
26 1. Cold water make-up.
27 2. Chilled water.
28 3. Refrigerant.
29 4. Glycol/brine.
30 5. Insulated duct.
31 6. Equipment or piping with a surface temperature below 65 degrees F.
32

33 3.02 PROTECTIVE JACKET INSTALLATION

- 34
35 A. Self-Adhering Jackets (SAJ):
36 1. Install according to manufacturer's recommendations.
37 2. Cut allowing minimum 4-inch overlap on ends and 6 inches on longitudinal joints.
38 3. Align parallel to surface.
39 4. Remove release paper and press flat to surface to avoid wrinkles.
40 5. Rub entire surface for full adhesion and sealing at joint overlaps.
41 6. On exterior applications, provide a bead of compatible caulk along exposed edges.
42 7. Piping with self-adhering jackets (SAJ) shall have elbows, fittings, valves and butt joints wrapped
43 with two (2) layers of vapor retarding tape.
44 8. Piping with a PVC jacket (PFJ) installed over the self-adhering jacket (SAJ) may be provided with
45 a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket.
46 9. Vapor retarding tape shall be compatible with jacket material.
47
48 B. Vapor Retarding Jackets (VRJ):
49 1. Piping with vapor retarding jackets (VRJ) shall have elbows, fittings, valves and butt joints
50 wrapped with two (2) layers of vapor retarding tape.
51 2. Piping with a PVC jacket (PFJ) installed over the vapor retarding jacket (VRJ).
52 3. Jackets may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and
53 valves under the PVC jacket.
54 4. Vapor retarding tape shall be compatible with the jacket material used.
55

56 3.03 PIPING, VALVE, AND FITTING INSULATION

1
2 A. General:

- 3 1. Install insulation with butt joints and longitudinal seams closed tightly.
4 2. Provide minimum 2-inch lap on jacket seams and 2-inch tape on butt joints, firmly cemented with
5 lap adhesive.
6 3. Additionally secure with staples along seams and butt joints.
7 4. Coat staples and longitudinal and transverse seams with vapor barrier mastic on systems requiring
8 vapor barrier.
9 5. Install insulation continuous through pipe hangers and supports with hangers and supports on
10 exterior of insulation.
11 6. Where a vapor barrier is not required or where roller hangers are not being used, hangers and
12 supports may be attached directly to piping with insulation completely covering hanger or support
13 and jacket sealed at support rod penetration.
14 7. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend
15 insulation and vapor barrier jacketing/coating around riser clamp.
16 8. Where insulated piping is installed on hangers and supports, insulation shall be installed
17 continuous through hangers and supports.
18 9. High density inserts shall be provided as required to prevent weight of piping from crushing
19 insulation.
20 10. Pipe shields are required at all support locations.
21 11. Insulation shall not be notched or cut to accommodate supporting channels.
22 12. Fully insulate all reheat coil piping, fittings and valves, with exception of unions, up to coil
23 connection to prevent condensation when coil is inactive during cooling season.
24 13. Provide a vapor-proof seal between pipe insulation and insulated coil casing.
25

26 B. Insulated Inserts and Pipe Shields:

- 27 1. Provide insulation inserts and pipe shields at all hanger and support locations.
28 2. Inserts may be omitted on 3/4-inch and smaller copper piping provided 12-inch long 22-gauge
29 pipe shields are used.
30 3. Provide pipe shields at all hanger and support locations.
31 4. Rigid insulation inserts shall be installed between pipe and insulation shields.
32 5. Quantity and placement of inserts shall be according to manufacturer's installation instructions;
33 however, inserts shall be no less than 12 inches in length.
34 6. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed as required for
35 system.
36

37 C. Fittings and Valves:

- 38 1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded
39 or built up insulation of same thickness as adjoining insulation.
40 2. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150
41 degrees F, with PVC fitting covers.
42 3. Secure PVC fitting covers with tack fasteners and 1-1/2-inch band of mastic over ends, throat,
43 seams and penetrations.
44 4. On systems requiring vapor barrier, use vapor barrier mastic.
45

46 D. Elastomeric and Polyolefin:

- 47 1. Where practical, slip insulation on piping during pipe installation when pipe ends are open.
48 2. Miter cut fittings allowing sufficient length to prevent stretching.
49 3. Completely seal seams and joints for vapor tight installation.
50 4. For elastomeric insulation, apply full bed of adhesive to both surfaces.
51 5. For polyolefin, seal factory preglued seams with roller and field seams and joints with full bed of
52 hot melt polyolefin glue to both surfaces.
53 6. Cover elastomeric insulation on systems operating below 40 degrees F with vapor barrier mastic.
54

55 E. Extruded Polystyrene and Polyisocyanurate:

- 56 1. Fittings, valves, unions, flanges, couplings and specialties shall be insulated with factory molded

- insulation of same thickness as adjoining insulation.
2. Secure insulation sections with two wraps of nylon filament tape 9-12 inches on center.
3. On single insulation layer systems and on outer layer of double insulation layer systems, apply a thin coat of elastomeric joint sealant rated for system operating temperatures to longitudinal and butt insulation joints covering entire face of joint.
4. Allow sealant to fully cure before applying protective covering.
5. For piping service below 0 degrees F, use two layers of insulation with inner and outer butt and longitudinal joints staggered and offset 90-degrees.
6. Where two layers of insulation are used, do not use sealant on inner layer or adhere inner layer to outer layer.
7. Fill voids in factory molded or built-up valve and fitting insulation with foamed in place urethane insulation.
8. Apply vapor stop bead of joint sealant between pipe and insulation on both sides of valves, expansion/contraction joints, flanges, thermometers/gauges, and attached vent and drain lines.
9. Insulate attached non-circulated lines, control lines, vents, etc. for a minimum distance of 6 inches from pipe.
10. Cover insulation with a protective covering of 2 coats of vapor barrier mastic with fabric reinforcing.
11. Do not penetrate protective covering or insulation with mechanical fasteners.

F. Pipe Insulation Schedule:

1. Provide insulation on new and existing remodeled piping as indicated in following schedule:

Service	Insulation Types	Jacket	Insulation Thickness in Inches by Pipe Size				
			≤ 1-1/4"	1-1/2"	2" to ≤ 4"	4" to 6"	8" and larger
Hot Water Heating	Rigid Fiberglass	ASJ	1-1/2	1-1/2	2	2	2
Chilled Water Piping	Polyiso/Polysty	VRJ or SAJ	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
Cold Water Piping	Rigid Fiberglass	ASJ	1/2	1/2	1	1	1
Cool. Coil Condensate	Rigid Fiberglass	ASJ	1/2	1/2	1	1	1

2. The following piping and fittings are not to be insulated:
 - a. Hot water piping inside radiation, convector, or cabinet heater enclosures.
 - b. Steam traps.
 - c. Piping unions for systems not requiring a vapor barrier.
3. For systems with fluid temperatures 65 degrees 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:
 - a. Flow sensing devices.
 - b. Circuit setters.
 - c. Manual ball valve air vents.
 - d. Drain valves.
 - e. Blowdown valves.
 - f. Pressure and temperature test plugs.
 - g. Grease fittings.
 - h. Pump bearing caps.
 - i. Equipment labels.
 - j. Covers shall be tight fitting to ensure a complete vapor barrier.

3.04 DUCT INSULATION

1 A. General:

- 2 1. Secure flexible duct insulation on sides and bottom of ductwork over 24-inch wide and all rigid
- 3 duct insulation with weld pins or speed clips.
- 4 2. Space fasteners 18-inches on center or less as required to prevent sagging for flexible duct
- 5 insulation.
- 6 3. Space fasteners not less than 3 inches from edge or corner and 12 inches on center or less for rigid
- 7 duct insulation.
- 8 4. Install weld pins without damage to interior galvanized surface of duct.
- 9 5. Clip pins back to washer and cover penetrations with tape of same material as jacket.
- 10 6. Firmly butt seams and joints and cover with 4-inch tape of same material as jacket.
- 11 7. Seal tape with plastic applicator and secure with staples.
- 12 8. Joints, seams, edges and penetrations shall be fully vapor sealed.
- 13 9. Stop and point insulation around access doors and damper operators to allow operation without
- 14 disturbing insulation or jacket material.
- 15 10. External supply duct insulation is not required where ductwork contains continuous 1-inch
- 16 acoustical liner.
- 17 11. Provide 4-inch overlap of external insulation over ends of acoustically lined sections.
- 18 12. Where insulated ductwork is supported by trapeze hangers, insulation shall be installed continuous
- 19 through the hangers. Drop support channels required to facilitate installation of insulation. Where
- 20 rigid board or flexible insulation is specified, install high density inserts to prevent weight of
- 21 ductwork from crushing insulation.
- 22 13. Where insulated low temperature (below 45 degrees F) ductwork is supported by steel metal straps
- 23 or wire ropes that are secured directly to the duct, straps or ropes shall be completely covered with
- 24 insulation and sealed to provide a complete vapor barrier.
- 25 14. Where insulated duct risers are supported by steel channels secured directly to the duct, extend
- 26 insulation and vapor barrier jacketing to encapsulate support channels.

27
28 B. Duct Insulation Schedule:

- 29 1. Provide duct insulation on new and existing remodeled ductwork in following schedule:

30	31 Service	32 Insulation Type	Jacket	Thickness (Inches)
33				
34				
35	Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2

36
37 3.05 DUCT LINING

38
39 A. Apply lining to the following ductwork:

- 40 1. Return air ducts within 20 feet of air handling unit connection.
- 41 2. Five (5) feet downstream of VAV terminal.
- 42 3. Transfer air ducts.

43
44 B. Do not apply lining to the following ductwork:

- 45 1. Outside air ductwork.
- 46 2. Kitchen exhaust ductwork.
- 47 3. Dishwashing exhaust ductwork.
- 48 4. Shower exhaust ductwork.
- 49 5. Pool ventilation ductwork.
- 50 6. Supply, return and exhaust ductwork associated with shop ventilation systems where air handling
- 51 units are located in shops.
- 52 7. Fume hood exhaust ductwork.
- 53 8. Supply ductwork associated with ventilation systems serving hospital critical areas.

54
55 C. Install liner in compliance with latest edition of NAIMA's Fibrous Glass Duct Liner Standard. Locate

56 longitudinal joints at corners of duct only.

- 1
2 D. Cut and fit to assure lapped, compressed joints. Coat all transverse and longitudinal joints and edges with
3 adhesive.
4
5 E. Provide metal nosing on leading edge where lined duct is preceded by unlined duct. Adhere liner to duct
6 with full coverage area of adhesive.
7
8 F. Additionally secure liner to duct using mechanical fasteners spaced as recommended by liner
9 manufacturer without compressing liner more than 1/8 inch with fasteners.
10
11 G. Duct dimensions indicated on drawings are net dimensions required for air flow. Increase duct sizes to
12 allow for liner thickness.
13

14 3.06 EQUIPMENT INSULATION

- 15
16 A. General:
17 1. Do not insulate over equipment access manholes, fittings, nameplates, or ASME stamps. Bevel
18 and seal insulation at these locations.
19 B.
20 Protective Jackets:
21 1. Provide a protective metal jacket (PMJ) for the following:
22 a. Generator exhaust pipe that is not concealed in a shaft.
23 b. Muffler.
24 2. Lap seams a minimum of 2 inches.
25 3. Secure with metal bands for end-to-end joints, and rivets or sheet metal screws for longitudinal
26 joints.
27 4. Rivets, screws, and bands to be constructed of same material as jacket. Locate seams on bottom
28 for exterior applications.
29
30 C. Elastomeric/Polyolefin:
31 1. Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints.
32 2. Place insulation with edge joints firmly butted pressing to surface for full adhesion.
33 3. Seal seams and joints vapor tight.
34
35 D. Equipment Insulation Schedule:
36 1. Provide equipment insulation as follows:

Equipment	Insulation Type	Jacket	Thickness (Inches)
Reheat coil casing in exposed supply ducts	Rigid Fiberglass	FSJ	2
Reheat coil casing in concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2

44
45 END OF SECTION 23 07 00

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SECTION 23 09 13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Control Dampers.
2. Control Valves.
3. Control System Instrumentation.
4. Thermostats.
5. Duct Smoke Detector and Fire Alarm Interface Modules.
6. Temperature Sensors.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC: Coordination.
3. Section 23 09 23 – Direct Digital Control System for HVAC.
4. Section 23 33 00 – Air Duct Accessories: Control damper installation.

1.02 QUALITY ASSURANCE

A. Contractor shall provide direct digital controls and building automation interface, as specified in Section 23 09 23 – Direct Digital Control System for HVAC.

B. Installing Contractor must be a manufacturer's branch office or an authorized representative of control equipment manufacturer that provides engineering and commissioning of manufacturers control equipment.

C. Submit written confirmation of such authorization from manufacturer.

D. Indicate in letter of authorization that installing Contractor has successfully completed necessary training required for engineering, installation, and commissioning of equipment and systems to be provided for project, and that such authorization has been in effect for a period of not less than three years.

E. DDC equipment may or may not be required to be installed by this contractor as part of project, but the intent of this quality assurance specification is to ensure that installing contractor has capabilities to engineer, install, and commission field devices supplied under this section for temperature control.

1.03 REFERENCES

A. Air Movement and Control Association (AMCA):

1. AMCA 500-D-Laboratory Method of Testing Dampers for Rating.

B. ASTM International (ASTM):

1. ASTM D635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
2. ASTM D1693 - Environmental Stress-Cracking of Ethylene Plastics.

C. Fluid Controls Institute (FCI):

1. FCI 70-2 - Control Valve Seat Leakage.

D. Underwriters Laboratories, Inc. (UL):

1. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1
2 1.04 SUBMITTALS
3

- 4 A. Division 01 – General Requirements: Requirements for submittals: Shop drawings, product data and
5 samples.
6
- 7 B. Submit the following information:
8 1. Manufacturer’s data sheets indicating model number, pressure and temperature ratings, capacity,
9 methods and materials of construction, installation instructions, and recommended maintenance.
10 2. General catalog sheets showing a series of same device is not acceptable unless specific model is
11 clearly marked.
12 3. Include temperature sensor color information offered by the manufacturer for Engineer approval.
13 4. Schematic flow diagrams of systems showing fans, pumps, coils, filters, dampers, valves, and
14 other control devices.
15 5. Label each device with setting or adjustable range of control.
16 6. Indicate wiring, clearly, differentiating between factory and field installed wiring.
17 7. Wiring should be shown in schematics that detail contact states and relay references;
18 Diagrammatic representations of devices alone are not acceptable.
19 8. Details of construction, layout, and location of each temperature control panel within building,
20 including instruments location in panel and labeling.
21 9. Include on Shop Drawings location of mechanical equipment controlled by room number,
22 horsepower and flow of motorized equipment when this data is available on Drawings, locations
23 of remote sensors and control devices by room number or column lines.
24 10. Schedule of control dampers indicating sizes, leakage rating, arrangement, pressure drop at design
25 airflow, and number and size of operators required.
26 11. Schedule of control valves indicating system in which device is to be used, rated capacity, flow
27 coefficient, flow required by device served, actual pressure drop at design flow, size of operator
28 required, close-off pressure, and locations where valves are to be installed.
29 12. A complete description of each control sequence for equipment that is controlled.
30 13. Prior to request for final payment, submit record documents which accurately record actual
31 location of control components including panels, thermostats, wiring, and sensors. Incorporate
32 changes required during installation and start-up.
33
- 34 C. Operating and Maintenance Manuals: Furnish three (3) bound operating and maintenance manuals for
35 review and approval prior to substantial completion, performance testing, and training. Manuals to
36 include the following:
37 1. Operation and maintenance instructions for equipment and systems provided.
38 2. Recommendations for frequency of service and preventative maintenance.
39 3. List indicating types and grades of oil and grease, packing materials, normal and abnormal
40 tolerances for devices, and method of equipment adjustment.
41 4. Description of recommended replacement parts and materials which Owner should stock.
42 5. A summary of equipment vendors, or location where replacement parts can be purchased.
43 6. Manufacturer's literature indicating features, materials of construction, and operating limits of
44 installed equipment. Brochures giving brief descriptions of multiple pieces of control apparatus
45 are not acceptable.
46 7. A complete set of control Record Drawings.
47 8. Name, address, and telephone number of person or office to contact for service during warranty
48 period.
49 9. Name, address, and telephone number of person or service organization to be contacted for service
50 after warranty period.
51

52 1.05 DEMOLITION
53

- 54 A. Where existing control devices, piping, or wiring are discontinued from use, remove and turn over to
55 Owner Representative. If Owner Representative does not want them remove from premises.
56
- 57 B. Remove any previously abandoned control devices in a similar manner.

1
2 1.06 DESIGN CRITERIA
3

- 4 A. Size control apparatus to properly supply and operate and control apparatus served.
5
6 B. Provide control devices subject to corrosive environments with corrosion protection or construct control
7 devices so they are suitable for use in such an environment.
8
9 C. Provide devices exposed to outside ambient conditions with weather protection or construct devices so
10 they are suitable for outdoor installation.
11
12 D. Use only UL labeled products that comply with NEMA Standards. Electrical components and installation
13 to meet requirements of electrical sections in Division 26 – Electrical.
14

15 1.07 TRAINING
16

- 17 A. Provide a minimum of 4 hours of training to Owner's personnel, concerning proper operation and
18 maintenance of all control systems and all sensing, monitoring, and control equipment. Conduct training
19 sessions during normal business hours after system start-up and acceptance by Owner.
20
21 B. Submit operating and maintenance manuals to Owner's Representative a minimum of five (5) working
22 days prior to training session. Use these manuals as basis for instruction at all training sessions.
23
24 C. Record video and audio of training sessions in a format acceptable to Owner's Representative.
25
26 D. Submit two copies of training session to Owner's Representative prior to request for final payment.
27
28 E. Provide two (2) follow-up visits for troubleshooting, one six months after substantial completion and the
29 other at end of warranty period. Length of each visit to be at discretion of Owner, for time necessary to
30 provide required information and complete troubleshooting and inspection activity.
31

32 1.08 MATERIAL DELIVERY AND STORAGE
33

- 34 A. Provide factory shipping cartons for each piece of equipment and control device. Contractor is
35 responsible for storage of equipment and materials inside and protected from weather.
36

37 PART 2 - PRODUCTS
38

39 2.01 INSTRUMENTATION AND CONTROL DEVICES
40

- 41 A. Manufacturers:
42 1. Siemens.
43 2. TAC.
44 3. Invensys, Siebe.
45 4. Equivalent as acceptable to Engineer.
46

47 2.02 CONTROL DAMPERS
48

- 49 A. Provide control dampers shown on Drawings and as required to perform specified functions.
50
51 B. Dampers shall be rated for velocities that will be encountered at maximum system design and rated for
52 pressure equal or greater than ductwork pressure class as specified in Section 23 31 00 – HVAC Ducts
53 and Casings, of ductwork where damper is installed.
54
55 C. Use only factory-fabricated dampers with mechanically captured replaceable resilient blade seals,
56 stainless steel jamb seals and with entire assembly suitable for maximum temperature and air velocities
57 encountered in system.

- 1
2 D. Dampers, unless otherwise specified, to be rated at a minimum of 180 degrees F working temperature.
3
4 E. Leakage testing shall be certified to be based on latest edition of AMCA Standard 500-D as follows:

<u>Damper Class</u>	<u>Differential Pressure</u>	<u>Leakage</u>
Class IA	1-inch w.g.	≤3 CFM/ft ²
Class I	4-inch w.g.	≤8 CFM/ft ²
Class I	8-inch w.g.	≤11 CFM/ft ²
Class I	12-inch w.g.	≤14 CFM/ft ²

- 5
6
7
8
9
10
11
12
13 F. Leakage rate dampers for differential pressures that they will encounter at maximum system design
14 pressures.
15
16 G. Steel Framed Dampers:
17 1. Manufacturers:
18 a. Nailor Models 2010 and 2020.
19 b. Greenheck Models VCD-33 and VCD-42.
20 c. Ruskin Models CD60 and CD40.
21 d. Equivalent as acceptable to Engineer.
22
23 H. Aluminum Frame and Blade Dampers:
24 1. Manufacturers:
25 a. Nailor Models 2010EAF and 202EAF.
26 b. Greenheck Model VCD-43.
27 c. Ruskin Model CD50.
28 d. Arrow Model AFD-20.
29 e. Equivalent as acceptable to Engineer.
30
31 I. Dampers used for directed mixing of air-streams to be parallel blade type, sized for air velocity of 1800 to
32 2000 fpm.
33
34 J. Dampers used for throttling or modulating applications other than air stream mixing to be opposed blade
35 type.
36
37 K. Two position dampers may be parallel or opposed blade type.
38
39 L. Dampers used for isolation on discharge of centrifugal fans shall have damper blades perpendicular to fan
40 shaft to minimize system effect.
41
42 M. Design dampers mounted with blades vertically for vertical blade orientation.
43
44 N. Dampers to have frames of not less than 16-gauge galvanized steel or 12-gauge extruded aluminum.
45 1. Blades shall be two-ply steel airfoil of not less than 2 x 20-gauge galvanized steel (14-gauge
46 equivalent) or extruded aluminum airfoil, with stainless steel, acetal, Celcon, bronze, or nylon
47 bearings.
48 2. Maximum allowable blade width is 8 inches. Use plated steel linkage hardware.
49
50 O. Maximum damper width is 48 inches; where required width exceeds 48 inches, use multiple damper
51 sections. Inside frame free area shall be a minimum of 90 percent of total inside duct area.
52
53 P. Multiple width damper sections shall utilize jackshaft linkages unless noted below.
54
55 Q. Sections over 144 inches wide shall be actuated from two locations on jackshaft.
56
57 R. Double width damper sections for two-position operation may be actuated without jackshafts if each

1 damper section is actuated separately.

- 2
- 3 S. Dampers that have multiple width and multiple vertical sections shall have a jackshaft for each vertically
- 4 stacked set of dampers and be provided with crossover linkages between jackshafts to transfer uneven
- 5 loading.
- 6
- 7 T. Extend jackshafts outside of ductwork for external actuator mounting.
- 8
- 9 U. Provide bearings on point of exit for support of damper shafts to prevent wear on shaft and ductwork.
- 10
- 11 V. If locating actuators out of air stream is impossible, obtain mounting location approval from Engineer
- 12 unless Contract Documents indicate in air stream mounting is acceptable.
- 13
- 14 W. Provide weatherproof stainless steel enclosures or NEMA 4X watertight actuator housing to prevent
- 15 actuator failure or freeze-up when mounting in locations exposed to harsh environments or outdoor
- 16 locations.
- 17
- 18 X. Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to
- 19 provide tight shutoff against system temperatures and pressure encountered.
- 20
- 21 Y. For electric modulating actuation, use fully proportional actuators with 0-10 VDC inputs and zero and
- 22 span adjustments.
- 23
- 24 Z. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be
- 25 used for hardwire interlocking.
- 26
- 27 AA. Actuator stroke times shall match requirements of DDC controllers provided under Section 23 09 23 -
- 28 Direct Digital Control System for HVAC and specific system requirements for proper operation.
- 29
- 30 BB. Electric actuators shall be provided with overload protection to prevent motor from damage when stall
- 31 condition is encountered.
- 32
- 33 CC. Provide operators with spring return for applications involving fire, freeze protection, moisture
- 34 protection, or specified normally open/closed operation.
- 35
- 36 DD. Provide damper end switches with form "C" contacts where control sequences require damper position
- 37 indication.
- 38
- 39 EE. This Contractor shall provide all power required for electric actuation if it is not able to be directly
- 40 provided from DDC controller.
- 41
- 42 FF. Provide operators with linkages and brackets for mounting on device served.

43

44 2.03 CONTROL VALVES

45

- 46 A. Provide control valves as indicated on Drawings and details and as required to perform functions
- 47 specified. Spring ranges must be selected to prevent overlap of operation and simultaneous heating and
- 48 cooling.
- 49
- 50 B. Size operators to allow smooth and positive operation of devices served and to provide sufficient torque
- 51 capacity for tight shutoff against system temperatures and pressure encountered.
- 52
- 53 C. For electric modulating actuation, use fully proportional actuators with 0-10 VDC inputs and zero and
- 54 span adjustments unless specified otherwise in chart below.
- 55
- 56 D. If TriState with feedback is specified, feed valve position back to controller and controller shall position
- 57 valve based on this feedback.

- 1
- 2 E. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be
- 3 used for hardwire interlocking.
- 4
- 5 F. For applications other than terminal units provide electric actuators with a manual override capability.
- 6
- 7 G. Provide electric actuators with a visible position indicator.
- 8
- 9 H. This Contractor shall provide power required for electric actuation if it is not able to be directly provided
- 10 from DDC controller.
- 11
- 12 I. Equip operators that are full proportioning or two-position, as required for specified sequence of
- 13 operation.
- 14
- 15 J. Provide spring-return for applications involving fire, freeze protection, moisture protection or specified
- 16 normally open/closed operation.
- 17
- 18 K. Valves shall move to their fail positions on loss of electrical power to actuator.
- 19
- 20 L. Size two-position shut-off valves for a maximum pressure drop of 2 PSI at design flow with minimum
- 21 size same as line size.
- 22
- 23 M. Provide operators with linkages and brackets for mounting on device served.
- 24
- 25 N. Valves, unless specifically noted on Drawings, or indicated below shall be globe style valves.
- 26

VALVE SERVING	TYPE Globe Butterfly (BF) Ball or Press Independent Ball (PI Ball)	SIGNAL 0-10 VDC TriState (24 VAC) 2-Position Electric	SPRING RETURN REQUIRED Yes / No	FAIL POSITION Open (thru Coil) Closed (bypass Coil) Last Position
Reheat Coil	Globe or Ball	0-10 VDC or TriState w/feedback	No	Last Position

27 See plan details, notes, and schedules for where two-way and three-way valves should be used.

- 28
- 29 O. Water Systems:
- 30 1. Use equal percentage valves for two-way control valves; size for a pressure drop not less than 3
- 31 psi nor more than 5 psi.
- 32 2. Use three-way valves sized for a maximum pressure drop of 5 psi that have linear characteristics
- 33 so that valve pressure drop remains constant regardless of valve position.
- 34 3. Globe Valves 2-Inch and Smaller (Terminal Unit Control):
- 35 a. Manufacturers:
- 36 i. Bellimo.
- 37 ii. Equivalent as acceptable to Engineer.
- 38 b. Minimum size for globe valves shall be 1.5 Cv.
- 39 c. Cast bronze or forged brass body, brass plug and brass or stainless steel seat, stainless steel
- 40 stem, screwed ends, suitable for use on water systems at 150 psig and 240 degrees F.
- 41 d. Seat leakage with actuator supplied will meet FCI class IV leakage (0.01 percent).
- 42

43 2.04 CONTROL SYSTEM INSTRUMENTATION

- 44
- 45 A. Duct Thermometers:
- 46 1. 3-1/2-inch dial type with swivel mount.
- 47 2. Maximum scale graduations of 2 degrees F.
- 48 3. Provide averaging type, liquid filled capillary sensing element.
- 49

- 1 B. Pipe Thermometers:
2 1. 9-inch stem type with an adjustable swivel mount.
3 2. Scale graduations of 2 degrees F and mid-range accuracy of ± 1 degree F.
4 3. Install thermometers in separable brass wells filled with conductive fluid.
5
6 C. Remote Bulb Thermometers:
7 1. 3-1/2-inch dial type with recalibration screw on face.
8 2. Accuracy within 1 percent of scale range.
9 3. Thermometers with sensing elements in air ducts with an area of above 4 square feet to have
10 averaging elements.
11 4. Provide separable wells for all pipeline applications.
12

13 2.05 ELECTRIC/ELECTRONIC THERMOSTATS
14

- 15 A. Low-Voltage Electronic Thermostats:
16 1. Manufacturers:
17 a. Honeywell
18 b. Alerton.
19 c. Viconics.
20 d. Equivalent as acceptable to Engineer.
21 2. Where unoccupied setpoints are specified, provide electronic programmable type with seven-day
22 setup/setback scheduling with a minimum of two occupied and unoccupied schedules per day
23 through keypad entry on front of unit.
24 3. For heating and cooling applications, provide automatic heating and cooling switchover.
25 4. For applications that control fans, provide fan override switch.
26 5. For ventilation or packaged economizer applications, provide a dry contact for ventilation damper
27 or economizer initiation.
28 6. For thermostat control of economizer, provide a 0-10 VDC modulated output for economizer
29 damper control.
30 7. For applications that require integration to building automation system, provide a BACnet
31 communication interface.
32 8. If a communication interface is specified, occupancy scheduling in thermostat is not required.
33
34 B. Firestats: UL labeled, manual reset, line voltage type with 135 degrees F setpoint.
35

36 2.06 DUCT SMOKE DETECTOR AND FIRE ALARM INTERFACE MODULES
37

- 38 A. Fire alarm control modules will be provided by others.
39
40 B. Provide wiring, conduit, and necessary interface with fire alarm system to perform specified sequence of
41 operation.
42

43 2.07 TEMPERATURE SENSORS
44

- 45 A. Manufacturers (Thermistor Temperature Sensor):
46 1. PreCon.
47 2. Allure by Distech.
48 3. TAC.
49 4. Equivalent as acceptable to Engineer.
50
51 B. Use thermistor or RTD type temperature sensing elements constructed so accuracy and life expectancy is
52 not affected by moisture, physical vibration, or other conditions that exist in each application.
53
54 C. RTD's shall be of nickel or platinum construction and have a base resistance of 1000 ohms at 70 degrees
55 F and 77 degrees F respectively.
56
57 D. 100-ohm platinum RTD's are acceptable if used with temperature transmitters.

- 1
2 E. Temperature sensing device used must be compatible with DDC controllers used on project.
3
4 F. RTD:
5 1. Accuracy (Room Sensor Only): Minimum ± 1.0 degrees F.
6 2. Accuracy (Averaging): Minimum ± 1.2 degrees F.
7 3. Accuracy (Other than Room Sensor or Averaging): Minimum ± 0.65 degrees F.
8 4. Range: minimum -40 to 220 degrees F.
9
10 G. Thermistor:
11 1. Accuracy (All): Minimum ± 0.36 degrees F.
12 2. Range: Minimum -30 to 230 degrees F.
13 3. Heat Dissipation Constant: Minimum 2.7 mW/degrees C.
14
15 H. Temperature Transmitter:
16 1. Accuracy: Minimum ± 0.1 degree F or ± 0.2 percent of span.
17 2. Output: 4-20 mA.
18
19 I. Provide limited range or extended range sensors if required to sense range expected for a respective point.
20
21 J. Use RTD type sensors for extended ranges beyond -30 to 230 degrees F.
22
23 K. If RTD's are incompatible with DDC controller direct temperature input use temperature transmitters in
24 conjunction with RTD's.
25
26 L. Use wire size appropriate to limit temperature offset due to wire resistance to 1.0 degree F.
27
28 M. If offset is greater than 1.0 degree F due to wire resistance, use temperature transmitter.
29
30 N. If feature is available in DDC controller, compensate for wire resistance in software input definition.
31
32 O. Provide sensors in occupied spaces with brushed aluminum or brushed nickel covers unless otherwise
33 noted or features specified will not allow for this.
34
35 P. Terminal unit sensors with set-point adjustments and digital displays may use plastic covers.
36
37 Q. Terminal unit sensors shall be provided with digital displays that indicate room temperature and set-point
38 and have a manual occupancy override and indication of occupancy status.
39
40 R. Provide set-point adjustment as specified in the DDC input/output summary table and sequence of
41 operation.
42
43 S. Use averaging elements on duct sensors when ductwork is four square feet or larger.
44
45 T. In piping systems use temperature sensors with separable wells designed to be used with temperature
46 element.
47

48 PART 3 - EXECUTION

49 3.01 INSTALLATION

- 50
51
52 A. Install system with trained mechanics and electricians employed by control equipment manufacturer or an
53 authorized representative of manufacturer.
54
55 B. Where installing Contractor is an authorized representative of control manufacturer, such authorization
56 shall have been in effect for a period of no less than three years.
57

- 1 C. Install control equipment, accessories, wiring, and piping in a neat and workmanlike manner.
- 2
- 3 D. Control devices must be installed in accessible locations.
- 4
- 5 E. Contractor shall verify that all control devices furnished under this Section are functional and operating
- 6 mechanical equipment as specified in Section 23 09 23 – Direct Digital Control System for HVAC.
- 7
- 8 F. Control Contractor to ensure that each device is operating per control sequences as specified in Section
- 9 23 09 23 – Direct Digital Control System for HVAC.
- 10
- 11 G. Label control devices with exception of dampers, valves, and terminal unit devices with permanent
- 12 printed labels that correspond to control drawings.
- 13
- 14 H. Identify temperature control junction and pullboxes by using spray painted green covers.
- 15
- 16 I. Other electrical system identification shall follow Division 26 – Electrical.
- 17
- 18 J. Mount control devices and electrical boxes mounted on insulated ductwork over insulation.
- 19
- 20 K. Provide mounting stand-offs where necessary for adequate support.
- 21
- 22 L. Cutting and removal of insulation to mount devices directly on ductwork is not acceptable.
- 23
- 24 M. This Contractor shall coordinate with insulation contractor to provide for continuous insulation of
- 25 ductwork.
- 26
- 27 N. Protect mounting of electrical or electronic devices from weather if building is not completely enclosed.
- 28
- 29 O. This Contractor shall be solely responsible for replacing any equipment that is damaged by water that
- 30 infiltrates building if equipment is installed prior to building being enclosed.
- 31
- 32 P. Provide electrical relays and wiring, line and low voltage, for control systems, devices, and components.
- 33
- 34 Q. Install high voltage and low voltage wiring, including low voltage cable, in metal conduit, Electrical Non-
- 35 metallic Tubing (ENT), or Electrical Metallic Tubing (EMT), as scheduled below and hereafter referred
- 36 to generically as conduit.
- 37
- 38 R. Reference Wire Conduit Installation Schedule below for specific conduit to be used.
- 39
- 40 S. Conduit shall be installed in accordance with Division 26 - Electrical of this specification and National
- 41 Electrical Code.
- 42
- 43 T. Conduit shall be a minimum of 1/2-inch for low voltage control provided pipe fill does not exceed 40
- 44 percent.
- 45
- 46 U. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. Low voltage
- 47 wiring to be stranded.
- 48
- 49 V. Low voltage wiring can be run without conduit above accessible lay-in tile ceilings.
- 50
- 51 W. Wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed
- 52 areas, and in other locations shall be in conduit.
- 53
- 54 X. Wire for wall sensors must be run in conduit.
- 55
- 56 Y. Run wiring for radiation valves in conduit where routed through walls.
- 57

- 1 Z. Where wiring is installed free-air, installation shall be as follows:
- 2 1. Wiring shall utilize cable tray wherever possible.
- 3 2. Wiring shall run at right angles and be kept clear of other trades work.
- 4 3. Support wiring using "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete,
- 5 piping supports, walls above ceiling or structural steel beams.
- 6 4. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung
- 7 without being threaded through ring.
- 8 5. For mounting rings that do not completely surround wire, attach wire to mounting ring with a
- 9 strap.
- 10 6. Space supports at a maximum 4-foot interval unless limited by building construction. If wiring
- 11 "sag" at mid-span exceeds 6 inches; provide an additional support.
- 12 7. Wiring shall never be laid directly on ceiling grid or attached in any manner to ceiling grid wires.
- 13 8. Sleeve wall penetrations.
- 14 9. Do not attach wiring to existing cabling, existing tubing, plumbing or steam piping, ductwork,
- 15 ceiling supports, or electrical or communications conduit.
- 16
- 17 AA. Control panels serving equipment fed by emergency power shall also be served by emergency power.
- 18
- 19 BB. This Contractor shall be responsible for 120 VAC power, not provided in Division 26 specifications,
- 20 required for equipment provided under this section.
- 21 1. Section 23 09 23 – Direct Digital Control System for HVAC Contractor may use power shown
- 22 for temperature control panels as shown on Drawings.
- 23
- 24 CC. Provide communication trunk wiring to integrated devices including VFD's, Flow Meters, Chillers,
- 25 Lighting Panels, and Electrical Meters, specified to be connected to building automation system.
- 26
- 27 DD. Provide communication trunk required by equipment specified under Section 23 09 23 - Direct Digital
- 28 Control System for HVAC and route to DDC panel designated for that equipment as shown on Drawings
- 29 or closest DDC panel if not designated.
- 30
- 31 EE. If communication trunks required daisy chained style wiring, provide two communication cables to DDC
- 32 panel so that communication trunk is not dead ended.
- 33
- 34 FF. Install "hand/off/auto" selector switches on systems where automatic interlock controls are specified and
- 35 "hand/off/auto" selector switches are not supplied with equipment controlled.
- 36
- 37 GG. Control panel power will not be required for "hand" switch to operate.
- 38
- 39 HH. When switch is in "hand" position, allow manual operation of selected device without operating
- 40 interlocked motors but allowing all unit safety devices to stay in circuit.
- 41
- 42 II. Electrical wiring is to be permanently tagged or labeled within one inch of terminal strip with a
- 43 numbering system to correspond with Record Drawings.
- 44
- 45 JJ. After completion of installation, test and adjust control equipment.
- 46
- 47 KK. Submit data showing set points and final adjustments of controls.
- 48

49 3.02 WIRE CONDUIT INSTALLATION SCHEDULE

50

- 51 A. Following conduit schedule shall apply to wire in conduit where conduit is specified for wiring.
- 52
- 53 B. Conduit referenced below shall meet specifications in Division 26 - Electrical.
- 54

55 3.03 CONTROL AND SMOKE DAMPERS

56

- 57 A. Control dampers furnished by control manufacturer are to be installed by Mechanical Contractor under

1 coordinating control and supervision of Control Contractor in locations shown on Drawings or where
2 required to provide specified sequence of control.
3

4 B. Coordinate installation with sheet metal installer to obtain smooth duct transitions where damper size is
5 different than duct size. Blank off plates will not be accepted.
6

7 C. Each operator shall serve a maximum damper area of 36 square feet. Where larger dampers are used,
8 provide multiple operators.
9

10 3.04 CONTROL VALVES

11
12 A. Temperature control valves furnished by control manufacturer are to be installed by Mechanical
13 Contractor under coordinating control and supervision of Control Contractor in locations shown on
14 Drawings or where required to provide specified sequence of control.
15

16 3.05 CONTROL SYSTEM INSTRUMENTATION

17
18 A. Install thermometers at each point of temperature transmission (sensors) and control, except reheat coils,
19 unless Drawings indicate a thermometer is to be installed by piping or sheet metal installer.
20

21 B. Install thermometers to permit easy reading from floor or operating platform.
22

23 C. Provide remote mounting or swiveled mounting as required for easy reading.
24

25 D. Flush mounting where not easily read is not acceptable.
26

27 3.06 ROOM THERMOSTATS AND TEMPERATURE SENSORS

28
29 A. Check and verify location of thermostats, humidistats, and other exposed control sensors with Drawings
30 and room details before installation.
31

32 B. Locate room thermostats and sensors 42 inches above floor.
33

34 C. Align with light switches and humidistats.
35

36 D. For drywall installations, thermostat mounting shall use a back-box attached to a wall stud. Drywall
37 anchors are not acceptable.
38

39 E. Mount any room thermostats or sensors mounted on an exterior wall on a thermally insulated sub-base.
40 Subbase to provide a minimum of one half inch of insulation.
41

42 F. Where thermostats or sensors are mounted on exterior walls or in any location where air transfer will
43 affect measured temperature or humidity seal conduit and any other opening that will effect measurement.
44

45 G. Provide guards on thermostats in entrance hallways, other public areas, or in locations where thermostat
46 is subject to physical damage.
47

48
END OF SECTION 23 09 13

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SECTION 23 09 23

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. The existing building utilizes a Niagara based direct digital control (DDC) system. This project will add new air terminal units and modify existing air terminal units and sections of wall fin radiation with DDC control that will be integrated into the existing building Niagara based DDC system. This project shall provide:
 - 1. All new Alerton controllers required to integrate two (2) new & six (6) existing to remain VAV air terminals into the existing building automation system.
 - 2. New hot water reheat DDC temperature control valves for new VAV air terminals.
 - 3. New space Alerton temperature sensors associated with each VAV air terminal.
 - 4. All control wiring (low and line voltage) for a complete operating system.
 - 5. Update of existing 3rd floor City County Building automation graphics to include new and existing air terminals, wall fin radiation, convectors, etc. associated with this project.
 - 6. Tie in of all new controllers to the existing JACE8 controller on the 3rd floor.
- B. All new controls shall be integrated into the Niagara based DDC system.
- C. All new controllers and space thermostats shall be Alerton, following City County Building protocols.
- D. All new controllers, control wiring and temperature control valves shall follow current City County Building protocols to provide building continuity in regard to controllers, wiring and equipment.
- E. Work in this section includes DDC panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete DDC system. This system interfaced with pneumatic/electric controls (Section 23 09 13) utilizing DDC signals to operate actuated control devices will meet, in every respect, all operational and quality standards specified herein.
 - 1. Part 1 – General
 - a. Scope
 - b. Related Work
 - c. Reference
 - d. Reference Standards
 - e. Other Work
 - f. Quality Assurance
 - g. Submittals
 - h. Operation and Maintenance Data
 - i. Material Delivery and Storage
 - 2. Part 2 – Products
 - a. General
 - b. Direct Digital Controls (DDC)
 - c. Networking / Communications
 - d. VAV Controllers (Application Specific Controllers)
 - e. Supervisory Controllers
 - f. Software License Agreement
 - g. Operator Interface Requirements
 - 3. Part 3 – Execution
 - a. General
 - b. Installation
 - c. Training
 - d. Commissioning, Verification and Closeout
 - e. Sequences of Operation
 - f. Input / Output Points List

1.02 RELATED WORK

- A. Applicable provisions of Division 1 govern work under this Section.

- B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination
 - C. Division 23 - HVAC - Equipment provided to be controlled or monitored
 - D. Division 26 - Electrical - Equipment provided to be controlled or monitored
- 1.03 REFERENCE
- A. Applicable provisions of Division 1 govern work under this section.
- 1.04 REFERENCE STANDARDS
- A. FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio Communication Interference
- 1.05 OTHER WORK
- A. The A/E must properly coordinate the necessary power wiring.
- 1.06 QUALITY ASSURANCE
- A. Manufacturer:
 - 1. Alerton controllers and field devices to be integrated into the existing Niagara based building automation system / front end. No other manufacturers will be considered.
 - B. Installer:
 - 1. The installer shall be specialized and experienced in Alerton / Niagara DDC control systems and installation for not less than 5 years. All engineering work shall be done by qualified employees of Alerton / Niagara, or qualified employees of an Alerton / Niagara Authorized Representative that provides engineering and commissioning of Alerton / Niagara control equipment. Where installing contractor is an authorized representative of Alerton / Niagara, 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 Alerton / Niagara 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 Alerton / Niagara or Authorized Alerton / Niagara 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 13 specification section.
 - 2. The only acceptable installing contractor for this project are:
 - a. CBRE|ESI
3410 Gateway Road
Brookfield, WI 53045
 - C. Response Time
 - 1. During warranty period, four (4) hours or less, 24-hours/day, 7 days/week.
 - D. Electrical Standards
 - 1. Provide electrical products, which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

E. DDC Standards

1. 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).

1.07 SUBMITTALS

A. Include the following information:

1. 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.
2. Product Data
 - a. 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.
3. Maintenance Data
 - a. Submit maintenance data and spare parts lists for each control device. Include this data in maintenance manual.
4. Record Drawings
 - a. Prior to request for final payment provide complete composite record drawings to incorporate the control work. All software addressing for device communication shall be noted for all devices provided under this section and the communication addressing required for devices provided by others that are integrated into the DDC system provided under this section. Point to point routing of communication trunks and power wiring between DDC controllers, DDC communication devices, control panels, and Ethernet switches shall be documented. Coordinate with the supplier of the equipment specified to be interfaced through digital communications for communication addressing. Provide circuit number of 120VAC panel power circuit(s) feeding each control panel on record drawings. Label circuit number(s) inside the panel served.

1.08 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.09 MATERIAL DELIVERY AND STORAGE

- A. Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide DDC control products in sizes and of capacities as required, conforming to manufacturer's standard materials and components as published in their product information, designed and constructed as recommended by the manufacturer and as required for application indicate.

- B. System shall be capable of operating with 120 VAC power supply, fully protected with a shutdown-restart

circuit, and associated hardware and software.

2.02 DIRECT DIGITAL CONTROLS

- A. Provide extension of existing DDC building automation system to the area of renovation. System to be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.
- B. DDC to consist of Supervisory Controllers, Programmable Controllers and stand-alone Application Specific Controllers (ASC's) as required.
- C. The vendor of the system provided under this Section shall provide all software and communication interface hardware necessary to program and upload/download programmable and application specific controllers from a laptop computer and make additional copies and future software revisions available for sale directly to the user Agency.
- D. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASC's, and operator devices.
- E. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2.03 NETWORKING/COMMUNICATIONS

- A. The design of the DDC shall be networked. The highest level networking shall use Ethernet and the sub-level networking shall use serial communications. Inherent in the system's design shall be the ability to expand or modify the highest network either via a local area network (LAN), wide area network (WAN), or a combination of the two schemes.
- B. The highest-level DDC communications network shall be capable of direct connection to and communication with a high-speed LAN or WAN utilizing an Ethernet connection.
- C. The supervisory controller shall directly oversee a local network such that communications may be executed directly to and between programmable controllers and ASC's. All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all points and application reports on the network.
- D. Provide serial communication ports on all ASC's for operator's terminal communications with the DDC Controller.
- E. Access to system data shall not be restricted by the hardware configuration of the DDC system.
- F. Global data sharing or global point broadcasting shall allow point data to be shared between programmable controllers and ASC's when it would be impractical to locate multiple sensors.

2.04 VAV CONTROLLERS (APPLICATION SPECIFIC CONTROLLERS)

- A. VAV controllers (ECB-VAV) shall be by Alerton. No others will be allowed.
- B. Provide minimum of 12 point VAV controller.
- C. Each supervisory controller shall be able to extend its monitoring and control through the use of stand-alone application specific controllers (ASC's).
- D. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor based, multi-tasking, real-time digital control processor.
- E. Each ASC shall have sufficient memory to support its own operating system and databases including:
 - 1. Control Processes
 - 2. Energy Management Applications

3. Operator I/O (Portable Service Terminal)

- F. The operator interface to any ASC point or program shall be through the supervisory controller connection to any ASC on the network.
- G. ASC's shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following information for the:
 - 1. Display temperatures
 - 2. Display status
 - 3. Display setpoints
 - 4. Display control parameters
 - 5. Override binary output control
 - 6. Override analog output control
 - 7. Override analog setpoints
 - 8. Modification of gain and offset constants
- H. All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.
- I. ASC's shall support, but not be limited to, the following configurations of systems to address current requirements as described in Section 23 09 13 of this specification, and for future expansion of air handling units:
 - 1. Variable Air Volume Terminals
 - 2. Reheat Terminals
- J. For butterfly type Variable Air Volume (VAV) Terminals, provide differential pressure transducers and damper actuators for flow measurement and actuation of the VAV terminal damper. Pressure transducers for VAV box flow applications do not need to have adjustable pressure ranges or integral display. Provide filter on high side of flow pickups if flow measurement device requires airflow through the device. All differential pressure transducer inputs for airflow measurement shall have a method to compensate for sensor drift to calibrate the zero point of the input. The differential pressure transducers and damper actuators can be integrated into the terminal unit controller or be discrete devices.
- K. Provide a method to view and print a summary of current K-factors for flow correction for each VAV terminal through the DDC system. The summary shall have a minimum of 50 K-factors per group of VAV terminals.
- L. All system setpoints, proportional bands, control algorithms, calibration constants, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.
- M. All application specific controllers shall be fully programmable. Question and answer or template programming is not acceptable unless this is used to generate the initial application program and the result is able to be freely modified without restriction. Control sequences for terminal unit control that utilize devices wired directly to the terminal unit application controller shall be programmed in the application specific controller and shall be stand-alone in function, i.e. occupancy sensing, temperature setpoint setback, etc. Supervisory controllers shall not be involved in the control sequence logic unless it involves sharing data between or from individual terminal unit controllers to be utilized in a global sequence, i.e. trim and respond strategies, terminal unit grouping, etc.

2.05 SUPERVISORY CONTROLLERS

- A. The existing JACE8 controller located on the 5th floor of the City County Building shall be used as the supervisory controller for this project.

2.06 SOFTWARE LICENSE AGREEMENT

- A. For Niagara based systems, it is the express goal of this specification to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The user Agency shall be the named license holder of all

software associated with any and all incremental work on the project(s). All Niagara software licenses shall have the “accept.station.in=*”, “accept.station.out=*” and “accept.wb.in=*” and “accept.wb.out=*” section of the software licenses. The intent is to ensure that the installed Niagara products may be completely open for integrations. The user Agency shall be free to direct the modification of the any software license, regardless of supplier. In addition, the user Agency shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the user Agency. Provide all software necessary for developing software algorithms in all supervisory, programmable, and application specific direct digital controllers which is licensed to the owner

- B. Programming tools for programmable and application specific controllers that utilize the Niagara Framework shall not be restricted to any specific brand of Jace. Tools and controllers shall be able to connect to any brand of Jace that are provided under this specification Section.

2.07 OPERATOR INTERFACE REQUIREMENTS

- A. The existing web-based browser interface and graphic-based display shall be used, expanded and modified to reflect the floor plan and DDC modifications and expansions as required as part of this project.

PART 3 - EXECUTION

3.01 GENERAL

- A. All electronic work required as an integral part of the DDC system work is the responsibility of this section unless specifically indicated otherwise in this section, Section 23 09 13, or in Division 26.
- B. This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and certificates required to install a complete DDC system as herein specified.
- C. Any and all points added with this project shall be grouped for display purposes into the system such that all points associated with a new or existing DDC system can appear together on the flat panel display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of DDC. It shall be possible to assign a point to appear in more than one system. An English descriptor and an alpha / numeric identifier shall identify each system.
- D. This DDC 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.

3.02 INSTALLATION

- A. 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 wiring and cable installation shall conform with the wiring installation as specified in the installation section of Section 23 09 13. All material shall be UL approved.
- B. Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.
- C. Line voltage wiring to power the DDC Controllers, not provided by the Division 26 contractor, to be by this contractor.
- D. Control panels serving equipment fed by emergency power shall also be served by emergency power.
- E. Provide uninterruptable power supplies where necessary to provide proper startup of equipment or to accomplish power restart control sequences specified.
- F. Label all control devices with the exception of dampers, valves, and terminal unit devices with permanent

printed labels that correspond to control drawings. Temperature control junction and pullboxes shall be identified utilizing spray painted green covers. Other electrical system identification shall follow the Division 26 specifications.

- G. 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.
- H. 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.
- I. Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.
- J. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded.
- K. 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.
- L. Where wiring is installed free-air, installation shall consider the following:
 - 1. Wiring shall utilize the cable tray wherever possible.
 - 2. Wiring shall run at right angles and be kept clear of other trades work.
 - 3. Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung without being threaded through the ring. For mounting rings that do not completely surround the wire, attach the wire to the mounting ring with a strap.
 - 4. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
 - 5. Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
 - 6. Wall penetrations shall be sleeved.
- M. Wiring shall not be attached to existing cabling, existing tubing, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
- N. 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.
- O. 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.
- P. All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labelled as "Spare".
- Q. Cable tray routing of the communication trunks is acceptable.

3.03 TRAINING

- A. 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 8 hours over (2) separate days.
- B. Provide two follow-up visits for troubleshooting and instruction, one 30 days after substantial completion and

the other 90 days after substantial completion. Length of each visit to be not less than 4 hours or the time necessary to provide required information and complete troubleshooting and inspection activity for all controls. Coordinate the visit with the owner and provide an inspection report to the owner of any deficiencies found.

3.04 COMMISSIONING, VERIFICATION AND CLOSEOUT

- A. Provide technician to work with air balancing contractor and/or provide balancing contractor with necessary hardware to over-ride DDC controllers for air balancing.
- B. 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.
- C. At the completion of the temperature controls system installation, and prior to substantial completion, the temperature control contractor shall verify and commission all HVAC building controls to verify all systems are calibrated, under control and functioning as specified and designed. Commissioning, verification and closeout shall include at a minimum:
 - 1. Verification that all points, alarms and equipment are integrated into the BAS and are graphically represented (accurately).
 - 2. Air Terminal Units with Reheat
 - a. Damper operation and control.
 - b. Reheat temperature control valve or stages of operation.
 - c. Occupied / Unoccupied setpoints and deadbands.
 - d. Occupancy sensor integration.
 - e. Sensor integration and calibration
 - 1) Discharge air temperature
 - 2) Space thermostat.
 - 3) Space humidity.
 - 4) Space CO.
 - f. Interlock and control with perimeter radiation (if installed).
 - 3. Fans
 - a. Fan interlocks with equipment.
 - b. Motorized or gravity backdraft damper operation.
 - c. Reverse acting thermostat control.
- D. Coordinate all space temperature setpoints and schedules with the tenant and facilities engineer. Record all setpoints and schedules. Include in the Operation and Maintenance Manuals.
- E. Temperature control contractor shall provide temperature control system self-commissioning and closeout report indicating systems commissioned and that all systems are functioning as specified and designed. This report, at a minimum shall include the following:
 - 1. Verification that all points and equipment are integrated into the BAS and are graphically represented (accurately).
 - 2. Date commissioned.
 - 3. Air Terminal Units with Reheat
 - a. Unit ID.
 - b. Control valve or stages of operation.
 - c. Occupied / Unoccupied setpoints and deadbands.
 - d. Verification that sensors are calibrated and integrated.
 - 4. Fans
 - a. Unit ID
 - b. Fan interlocks with equipment.
 - c. Reverse acting thermostat setpoint.
- F. Contractor to provide all documentation in a written report. Report shall be signed and dated that all systems have been commissioned and verified to be in working order in accordance with plans and specifications.
 - 1. Submit final report for review by the Owner and A/E.
 - 2. Include final report in the Operation and Maintenance manuals.

3.05 SEQUENCE OF OPERATION

RFB No. 320028

Direct Digital Control System for HVAC

23 09 23 - 8

- A. Variable Air Volume Terminals with Hot Water Reheat
1. Systems consist of:
 - a. Variable air volume terminal
 - b. Hot water reheat coil with 2-way temperature control valve.
 - c. DDC space sensor.
 - d. Lighting Occupancy Sensor (Sensor provided and installed by electrical contractor, Large Conference Room Only).
 2. Provide all line and low voltage wiring for a complete operating system.
 3. 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.
 4. Replicate existing BAS control sequence for other similar spaces within this Suite & use for new & existing to remain, but modified, VAV terminals.
 5. 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.).
 6. 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.
 7. 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.
- B. Variable Air Volume Terminals with Hot Water Reheat and Perimeter Radiation
1. Systems consist of:
 - a. Variable air volume terminal
 - b. Hot water reheat coil with 2-way temperature control valve.
 - c. Existing steam convactor with new 2-way DDC control valve and actuator.
 - d. DDC discharge air sensor.
 - e. DDC space sensor.
 2. Provide all line and low voltage wiring for a complete operating system.
 3. Mount discharge air temperature sensor a minimum of 3 duct diameters downstream of reheat coil
 4. 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.
 5. Replicate existing BAS control sequence for other similar spaces within this Suite & use for new & existing to remain, but modified, VAV terminals & perimeter radiation.
 6. 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.).
 7. In the unoccupied mode, the perimeter radiation shall be enabled to provide unoccupied heating.

SECTION 23 21 13

HYDRONIC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Heating hot water pipe and fittings.
2. Heat pump pipe and fittings.
3. Chemical treatment pipe and fittings.
4. Vents, drain, and relief valve pipe and fittings.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 15 - Piping Specialties.
3. Section 23 05 23 - General-Duty Valves for HVAC Piping.
4. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
5. Section 23 07 00 - HVAC Insulation.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. ASME B16.1 – Cast Iron Pipe Flanges And Flanged Fittings
2. ASME B16.3 - Malleable Iron Threaded Fittings.
3. ASME B16.5 - Pipe Flanges and Flanged Fittings.
4. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings.
5. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
6. ASME B16.22 - Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings.
7. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV.
8. ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV.
9. ASME B31.9 - Building Services Piping.
10. ASME BPVC Section IX - Welding and Brazing Qualifications.

B. ASTM International (ASTM):

1. ASTM A47 - Specification for Ferritic Malleable Iron Castings.
2. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
3. ASTM A105 - Specification for Forgings, Carbon Steel, for Piping Components.
4. ASTM A126 - Specification for Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
5. ASTM A181 - Specification for Forgings, Carbon Steel for General Purpose Piping.
6. ASTM A182 - Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
7. ASTM A197 - Specification for Cupola Malleable Iron.
8. ASTM A234 - Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
9. ASTM A403 - Specification for Wrought Austenitic Stainless Steel Piping Fittings.
10. ASTM B32 - Specification for Solder Metal.
11. ASTM B75 - Specification for Seamless Copper Tube.
12. ASTM B88 - Specification for Seamless Copper Water Tube.
13. ASTM B813 – Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.
14. ASTM D2513 – Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
15. ASTM D3139 – Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric

1 Seals.

- 2 16. ASTM D3261 – Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for
3 Polyethylene (PE) Plastic Pipe and Tubing.
4 17. ASTM D3350 – Specification for Polyethylene Plastics Pipe and Fittings Materials.
5 18. ASTM F-1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for
6 Use in Piping Applications.

7
8 1.03 SUBMITTALS

- 9
10 A. Division 01 - Submittal Procedures: Shop Drawings, product data, and samples.
11
12 B. Contractor shall submit schedule indicating ASTM designation of proposed pipe along with its type and
13 grade and sufficient information to indicate type and rating of fittings for each service.
14
15 C. Type F Steel Pipe: Statement from manufacturer on his letterhead that pipe furnished meets ASTM
16 specification contained in this section.
17
18 D. Type E or S Steel Pipe:
19 1. Mill certification papers, also known as material test reports, for pipe furnished for this project, in
20 English.
21 2. Heat numbers on these papers to match heat numbers stenciled on pipe.
22 3. Chemical analysis indicated on mill certification papers to meet or exceed requirements of
23 referenced ASTM specification.
24
25 E. Copper Tube: Statement from manufacturer on his letterhead that pipe furnished meets ASTM
26 specification contained in this section.
27
28 F. Welder Qualifications:
29 1. Before any metallic welding is performed, Contractor shall submit his Standard Welding
30 Procedure Specifications, Procedure Qualification Records and Qualification Test Records for
31 each Welder along with associated continuity records to demonstrate compliance with ASME
32 Section IX, paragraph QW-322.
33 2. Contractor shall maintain a complete set of welder qualification documents at jobsite, including
34 Test Records and Continuity Records for each welder.
35 3. Engineer or Owner's Representative reserves right to test the Work of any welder employed on
36 the Project, at Contractor's expense.
37 4. Testing will include a visual examination of pipe and weld and may include radiography of any
38 suspect welds.
39 5. If the Work of welder is unsatisfactory, prevent welder from doing further welding on the Project.
40 6. Repair any welds deemed unacceptable at Contractor's expense.

41
42 1.04 QUALITY ASSURANCE

- 43
44 A. Order Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or
45 each bundle, depending on size of pipe, and in accordance with appropriate ASTM specification.
46
47 B. Contractor must replace any installed material not meeting specification requirements with material that
48 meets these specifications without additional cost to Owner.
49
50 C. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single
51 manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
52
53 D. All castings used for grooved coupling housings, fittings, valve bodies, etc., shall be date stamped for
54 quality assurance and traceability.

55
56 1.05 DELIVERY, STORAGE, AND HANDLING

- 1 A. Promptly inspect shipments to insure that material is undamaged and complies with specifications.
- 2
- 3 B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation.
- 4
- 5 C. Do not store materials directly on grade.
- 6
- 7 D. Protect pipe, tube, and fitting ends from damage. Take precautions to keep provided or specified end
- 8 caps in place.
- 9
- 10 E. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- 11
- 12 F. Offsite storage agreements will not relieve Contractor from using proper storage techniques.
- 13
- 14 G. Storage and protection methods must allow inspection to verify products.

15 1.06 DESIGN CRITERIA

- 16 A. Use only new material, free of defects, rust, and scale, meeting latest revision of ASTM specifications as
- 17 listed in this Section.
- 18
- 19 B. Construct piping for highest pressures and temperatures in respective system in accordance with ASME
- 20 B31.9, but not less than 125 psig unless specifically indicated otherwise.
- 21
- 22 C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a
- 23 centerline radius of 1.5 pipe diameters.
- 24
- 25 D. Where ASTM A53 Type F pipe is specified, Contractor may substitute ASTM A53 Grade A Type E or S,
- 26 or ASTM A53 Grade B Type E or S at Contractor's option.
- 27
- 28 E. Where ASTM A53, Grade A pipe is specified, Contractor may substitute ASTM A53 Grade B pipe at
- 29 Contractor's option.
- 30
- 31 F. Where grade or type is not specified, Contractor may choose from those commercially available.
- 32
- 33 G. Where ASTM B88, Type L hard temper copper tubing is specified, Contractor may substitute ASTM
- 34 B88, Type K hard temper copper tubing.
- 35
- 36 H. Non-metallic piping is acceptable only for the services indicated.
- 37
- 38 1. It is not acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings
- 39 except for venting of sealed combustion, condensing gas fired appliances.
- 40
- 41 2. When used in ceiling plenums, PVC piping and the piping installation shall conform with
- 42 applicable codes and standards for installation of PVC piping within a ceiling plenum.

43 PART 2 - PRODUCTS

44 2.01 HEATING HOT WATER PIPE AND FITTINGS

- 45
- 46 A. 2-Inch and Smaller: ASTM A53, Type F, Schedule 40, black steel pipe with ASTM A197/ASME B16.3,
- 47 class 150, standard weight malleable iron threaded fittings.
- 48
- 49 B. 2-1/2-Inch and Larger: ASTM A53, Schedule 40, black steel pipe with ASTM A234 grade WPB/ASME
- 50 B16.9 standard weight, seamless, carbon steel weld fittings.
- 51
- 52 C. Contractor may use ASTM B88 seamless, Type L, hard temper copper tube with ASME B16.22 wrought
- 53 copper solder-joint fittings in lieu of steel pipe for all sizes.
- 54
- 55 D. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for
- 56
- 57

1 branch takeoff up to one-half (1/2) diameter of main.
2

- 3 E. Mechanical Joined Fittings: "Pro-press" mechanical joined fittings may be used for pipe sizes 2" and
4 smaller at Contractor's option. Fittings shall meet the requirements of ASME B16.18 or ASME B16.22.
5

6 2.02 HEAT PUMP WATER PIPE AND FITTINGS
7

- 8 A. 2-Inch and Smaller: ASTM A53, Type F, Schedule 40, black steel pipe with ASTM A197/ASME B16.4,
9 Class 150, standard weight malleable iron threaded fittings.
10
11 B. 2-1/2-Inch and Larger: ASTM A53, Schedule 40, black steel pipe with ASTM A234 Grade WPB/ASME
12 B16.9 standard weight, seamless, carbon steel weld fittings.
13
14 C. Contractor may use ASTM B88 Seamless, Type L, hard temper copper tube with ASME B16.22 wrought
15 copper solder-joint fittings in lieu of steel pipe for all sizes.
16
17 D. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for
18 branch takeoff up to one-half (1/2) diameter of main.
19

20 2.03 CHEMICAL TREATMENT PIPE AND FITTINGS
21

- 22 A. Use pipe and pipe fittings as specified for system to which chemical treatment piping is connected.
23 Plastic pipe furnished with chemical treatment materials may be used if its pressure and temperature
24 ratings are acceptable for service.
25

26 2.04 VENT, DRAIN, AND RELIEF VALVE PIPE AND FITTINGS
27

- 28 A. Use pipe and fittings specified for system to which vent, drain, or relief valve is connected.
29

30 2.05 UNIONS AND FLANGES
31

- 32 A. 2-Inch and Smaller (Black Steel Piping):
33 1. ASTM A197/ASME B16.3 malleable iron unions with brass seats.
34 2. Use black malleable iron on black steel piping.
35 3. Use unions of a pressure class equal to or higher than that specified for fittings of respective
36 piping service but not less than 250 psi.
37
38 B. 2-1/2-Inch and Larger:
39 1. ASTM A181 or A105, Grade 1 hot forged steel flanges or threaded, welding and pressure class
40 compatible with that specified for valves, piping specialties, and fittings of respective piping
41 service.
42 2. Flanges smaller than 2-1/2-inch may be used as needed for connecting to equipment and piping
43 specialties.
44 3. Use raised face flanges ASME B16.5 for mating with other raised face flanges on equipment with
45 flat ring or full face gaskets.
46 4. Use ASME B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on
47 equipment.
48
49 C. Copper Piping Systems:
50 1. ASME B16.18, cast copy alloy body or ASEM B16.22 wrought copper alloy body unions with
51 metal to metal seats and soldered ends.
52

53 2.06 GASKETS
54

- 55 A. Manufacturers:
56 1. Klingersil C4401
57 2. Garlock 3000.

- 3. JM Clipper 978.
- 4. Equivalent as acceptable to Engineer.

B. Water and Glycol Systems: Branded, compressed, non-asbestos sheet gaskets.

2.07 MECHANICAL GROOVED PIPE CONNECTIONS

A. Manufacturers:

- 1. Victaulic.
- 2. Anvil Corporation.
- 3. Equivalent as acceptable to Engineer.

B. Mechanical grooved pipe couplings and fittings may be used with steel pipe on systems indicated below.

C. Cut-groove or equivalent roll-groove products are acceptable providing product meets system temperature and pressure requirements.

D. Where ductile iron fittings are indicated, conform to ASTM A536.

E. Where forged steel fittings are indicated, conform to ASTM A234, Grade WPB.

F. Where fabricated steel fittings are indicated, conform to ASTM A53, Type F in sizes 3/4-inch through 1-1/2-inch and Type E or S, grade B in sizes 2-inch through 20-inch.

G. Do not use fabricated fittings where malleable iron or forged steel fittings are available.

H. Gaskets shall be EPDM suitable for temperatures to 230 degrees F or EPDM-HP for water temperatures to 250 degrees F.

I. Fittings and couplings must be suitable for temperature and pressure involved. In no case is final system to have a pressure rating of less than 200 psig at design temperature of fluid.

J. Acceptable fittings and couplings are listed below, based on Victaulic. Use galvanized couplings on galvanized piping and fittings. Use enamel coated couplings on black steel piping and fittings.

K. Couplings: Pressure-responsive gasket and ASTM A449 compliant bolts and nuts. Couplings shall conform to ASTM F-1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

- 1. Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Basis of Design: Victaulic Style 107N (2-12"), W07 (14-24").
- 2. Flexible: Use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Installation-Ready Style 177 (2-12"), W77 (14-24").
- 3. Reducing couplings are not acceptable.

L. Flanges/Adapters: Ductile Iron, Style 741 or W741 except at lug type butterfly valves use standard welding flanges.

M. Fittings:

- 1. Ductile Iron elbows and tees of manufacturer's standard line may be used in all sizes except bullhead tees shall not be accepted.
- 2. Fabricated steel fittings may be used in sizes where fitting wall thickness conforms to standard weight pipe.
- 3. Mechanical-T Style 920 fittings with malleable iron housings may be used for up to 2-inch outlet size.

PART 3 - EXECUTION

1
2 3.01 ERECTION
3

- 4 A. Carefully inspect pipe, fittings, valves, equipment, and accessories before installation.
5
6 B. Reject any items that are unsuitable, cracked, or otherwise defective and remove from jobsite
7 immediately.
8
9 C. Excluding minor surface rust, piping that exhibits significant oxidation or corrosion will be rejected.
10
11 D. Exercise care at every stage of storage, handling, laying, and erecting to prevent entry of foreign matter
12 into piping, fittings, valves, equipment, and accessories.
13
14 E. Do not erect or install any item that is not clean.
15
16 F. Remove loose dirt, scale, oil, chips, burrs, and other foreign material from internal and external surfaces
17 of pipe and piping components prior to assembly, including debris associated with cutting, threading, and
18 welding.
19
20 G. During fabrication and assembly, remove slag and weld spatter from internal pipe surfaces at joints by
21 peening, chipping, and wire brushing.
22
23 H. During construction, until system is fully operational, keep openings in piping and equipment closed
24 except when performing actual work on that item of system. Use plugs, caps, blind flanges, or other
25 items designed for this purpose.
26
27 I. Furnish and install flanges, caps, bypasses, drains, and valves required to facilitate flushing and draining
28 heating and cooling system piping.
29
30 J. Install piping parallel to building walls and ceilings and at heights not obstructing any portion of a
31 window, doorway, stairway, or passageway.
32
33 K. Where interferences develop in field, offset or reroute piping as required to clear such interferences.
34
35 L. In all cases, consult Drawings for exact location of pipe spaces, ceiling heights, door and window
36 openings, or other architectural details before installing piping.
37
38 M. Provide anchors, expansion joints, swing joints, and expansion loops to allow piping to expand and
39 contract without damage to itself, equipment, or building.
40
41 N. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are
42 not acceptable.
43
44 O. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) diameter of main.
45
46 P. Install drains throughout systems to permit complete drainage.
47
48 Q. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards,
49 including required service space for this equipment, unless piping is serving this equipment
50
51 R. Install valves, control valves, and piping specialties, including items furnished by others, as specified and
52 detailed.
53
54 S. Make connections to equipment installed by others where that equipment requires piping services
55 indicated in this section.
56

57 3.02 PIPE JOINTS AND CONNECTIONS

1
2 A. Welded Pipe Joints

- 3 1. Make welded joints by fusion welding in accordance with ASME B31.9, and State and local codes
4 where applicable.
5 2. Qualified welders shall complete pipe welding in accordance with Contractor's Procedure
6 Specifications.
7 3. Contractor shall ensure these steps are followed where joining pipe sections by welding:
8 a. Cleaning: Welding surfaces shall be clean and free of defects.
9 b. Alignment: Align inside diameter of piping components as accurately as possible.
10 Internal misalignment shall not exceed 1/16-inch.
11 c. Spacing: Space pipe sections to allow deposition of weld filler material through entire
12 weld joint thickness.
13 d. Girth Butt Welds:
14 i. Girth butt welds shall be complete penetration welds.
15 ii. Concavity shall not exceed 1/32-inch.
16 iii. Under cuts shall not exceed 1/32-inch.
17 iv. As welded surfaces are permitted however, surfaces shall be free from coarse
18 ripples, grooves, abrupt ridges, and valleys.
19 4. Electrodes shall be Lincoln, or an approved equal, with coating and diameter as recommended by
20 manufacturer for type and thickness of this work.
21

22 B. Threaded Pipe Joints

- 23 1. Use a Teflon based thread lubricant or Teflon tape when making joints. Hard setting pipe thread
24 cement or caulking shall not be permitted.
25

26 C. Mechanical Grooved Pipe Connections

- 27 1. Use pipe factory grooved in accordance with coupling manufacturer's specifications or field
28 grooved pipe in accordance with same specifications using specially designed tools available for
29 application.
30 2. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from
31 pipe end to (and including) groove.
32 3. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the
33 intended service.
34 4. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with coupling
35 manufacturer's specifications.
36 5. Support pipe as indicated in Section 23 05 29 – Hangers and Supports for HVAC Piping and
37 Equipment, except as modified below.
38 6. Support each horizontal pipe section at least once between couplings and at change in direction of
39 flow.
40 7. Support vertical pipe at every other floor or every other pipe length, whichever is more frequent.
41 Set base of riser or base fitting on a pedestal or foundation.
42 8. Follow coupling manufacturer's installation recommendations if they are more stringent than above
43 requirements.
44 9. A factory trained representative of the coupling manufacturer shall provide on-site training for
45 contractor's field personnel in the use of grooving tools, application of groove, and product
46 installation. The representative shall periodically visit the job site and review installation to ensure
47 best practices in grooved joint installation are being followed. Contractor shall remove and replace
48 any improperly installed products.
49

50 D. Copper Pipe Joints

- 51 1. Remove slivers and burrs remaining from cutting operation by reaming and filing both pipe
52 surfaces.
53 2. Clean fitting and tube with emery cloth or sandpaper.
54 3. Remove residue from cleaning operation, apply flux, and assemble joint.
55 4. Use 95-5 solder or brazing to secure joint as specified for specific piping service.
56 5. Where mechanically formed tee fittings are permitted, form mechanically extracted collars in a
57 continuous operation, consisting of drilling a pilot hole and drawing out tube surface to form a

- 1 collar having a height of not less than three times thickness of tube wall.
2 6. Use an adjustable collaring device.
3 7. Notch and dimple branch tube.
4 8. Braze joint, applying heat properly so that pipe and tee do not distort; remove distorted
5 connections.

6
7 E. Mechanical Press Formed Fittings

- 8 1. Install fittings in strict accordance with manufacturer's installation instructions.
9 2. Use manufacturer approved press tools.

10
11 3.03 WATER SYSTEM PIPING

- 12
13 A. Run water mains level or pitch horizontal mains up 1-inch in 40 feet in direction of flow.
14
15 B. Install manual air vents at high points where air may collect.
16
17 C. If vent is not in an accessible location, extend air vent piping to nearest code acceptable drain location
18 with vent valve located at drain.
19
20 D. Main branches and runouts to terminal equipment may be made at top, side, or bottom of main provided
21 that there are drain valves suitably located for complete system drainage and manual air vents are located
22 as described above.
23
24 E. Use top connection to main for upfeed risers and bottom connection to main for downfeed risers. Make
25 connections at main with a tee and 45-degree elbow.
26
27 F. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for
28 expansion and contraction of piping systems.
29
30 G. Offset pipe connections at equipment to allow for service, such as removal of terminal device.
31
32 H. Use eccentric fittings for changes in horizontal pipe sizes with fittings installed for proper air venting.
33 Concentric fittings may be used for changes in vertical pipe sizes.

34
35 3.04 CHEMICAL TREATMENT PIPING

- 36
37 A. Install chemical treatment piping as indicated on Drawings, as detailed, and as recommended by supplier
38 of chemical treatment equipment.
39

40 3.05 VENT, DRAIN, AND RELIEF VALVE PIPING

- 41
42 A. Install vent, drain, and relief valve discharge piping as indicated on Drawings, as detailed, and as
43 specified for each specific valve or piping specialty item.
44
45 B. Relief valve discharge piping to be terminated at floor drain or floor sink.

46
47 3.06 UNIONS AND FLANGES

- 48
49 A. Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece
50 of equipment which may require removal for maintenance, repair, or replacement.
51
52 B. Where a valve is located at a piece of equipment, locate flange or union connection on equipment side of
53 valve.
54
55 C. Concealed unions or flanges are not acceptable.
56
57 D. Unions and flanges for servicing and disconnect are not required in installations using grooved

1 mechanical joint couplings. The couplings shall serve as disconnect points if required.

2
3 3.07 GASKETS

- 4
5 A. Store horizontally in cool, dry location and protect from sunlight, water, and chemicals.
6
7 B. Inspect flange surfaces for warping, radial scoring, or heavy tool marks.
8
9 C. Inspect fasteners, nuts, and washers for burrs or cracks. Replace defective materials.
10
11 D. Align flanges parallel and perpendicular with bolt holes centered without using excessive force. Center
12 gasket in opening.
13
14 E. Lubricate fastener threads, nuts, and washers with lubricant formulated for application.
15
16 F. Draw flanges together evenly to avoid pinching gasket. Tighten fasteners in cross pattern sequence (12 –
17 6 o'clock, 3 – 9 o'clock), one pass by hand and four passes by torque wrench at 30 percent full torque, 60
18 percent full torque, and two passes at full torque per ASME B16.5.
19

20 3.08 PIPING SYSTEM LEAK TESTS

- 21
22 A. Verify that piping system being tested is fully connected to components and that equipment is properly
23 installed, wired, and ready for operation.
24
25 B. If required for additional pressure load under test, provide temporary restraints at expansion joints or
26 isolate them during test.
27
28 C. Verify that hangers can withstand any additional weight load imposed by test.
29
30 D. Provide piping, fittings, blind flanges, and equipment to perform testing.
31
32 E. Conduct pressure test with test medium of air or water unless specifically indicated.
33
34 F. Minimum test time is indicated in table below; additional time may be necessary to conduct an
35 examination for leakage.
36
37 G. Engineer, Owner's Representative or Construction Manager must witness each test. If leaks are found,
38 repair area with new materials and repeat test. Caulking will not be acceptable.
39
40 H. Do not insulate pipe until it is successfully tested.
41
42 I. For hydrostatic tests, use clean water and remove air from piping being tested by means of air vents or
43 loosening of flanges and unions.
44
45 J. Measure and record test pressure at high point in system.
46
47 K. For air tests, gradually increase pressure to not more than one-half of test pressure; then increase pressure
48 in steps of approximately one-tenth of test pressure until reaching required test pressure. Examine joints
49 and connections with a soap bubble solution or equivalent method.
50
51 L. Piping system, exclusive of possible localized instances at pump or valve packing, shall show no
52 evidence of leaking.
53
54 M. After testing is complete, slowly release pressure in a safe manner.

55
56

<u>System</u>	<u>Medium</u>	<u>Pressure</u>	<u>Duration</u>
Heating hot water	Water	100 psig	8 hours

57

1 Heat pump water Water 100 psig 8 hours

- 2
- 3 N. Pressure tests are to be documented on a form included in this specification.
- 4
- 5 O. On piping that cannot be tested because of connection to an active line, provide temporary blind flanges
- 6 and hydrostatically test new section of piping.
- 7
- 8 P. After completion of test, remove temporary flanges and make final connections to piping.
- 9
- 10 Q. Die penetrate test pass weld or x-ray piping that was not hydrostatically tested up to active system.

11

12 3.09 HYDRONIC PIPING SYSTEM FLUSHING

13

- 14 A. Thoroughly flush new system piping before putting systems in to operation.
- 15
- 16 B. Subsequent to executing chemical cleaning processes specified in Section 23 25 00 – HVAC Water
- 17 Treatment, and prior to adding scale and corrosion inhibitors, flush piping and components with a clean
- 18 source of water until discharge from system is clean.
- 19
- 20 C. Discharge at drains provided at low points in piping, ends of headers, and as otherwise necessary to flush
- 21 and drain entire system.
- 22
- 23 D. Establish project specific procedures prior to flushing.
- 24
- 25 E. Before beginning flushing operations, submit proposed flushing procedures to Engineer/Architect and
- 26 Construction Manager for review and approval.
- 27
- 28 F. Provide minimum 72 hours notice to Owner's Representative and Construction Manager to allow
- 29 observation of flushing operations.
- 30
- 31 G. Tap a clean water source into system downstream of main circulation pump(s).
- 32
- 33 H. Provide minimum 2-inch connection between water source and hot water/chilled water systems including
- 34 taps with ball valves, or line size tap and ball valve for piping systems smaller than 2-inch.
- 35
- 36 I. Provide minimum 2-inch, or line size if mains are smaller than 2-inch, taps at ends of headers, low point
- 37 of each main on each floor, and as otherwise necessary to flush and drain entire system.
- 38
- 39 J. Provide minimum 2-inch bypass with shut off valve, or line size if mains are smaller than 2-inch, between
- 40 supply and return mains on each floor.
- 41
- 42 K. Contractor shall identify proposed clean water source along with method/location of drain discharge and
- 43 review with Construction Manager prior to installing flushing connections to water source and drain
- 44 outlets.
- 45 L. Do not use Owner's chilled water system as a source of water for flushing any piping.
- 46
- 47 M. Provide code required temporary backflow prevention for clean water source if needed.
- 48
- 49 N. Provide temporary taps, valves, piping, bypasses, and hoses as needed to accomplish flushing procedures.
- 50
- 51 O. Flush piping systems using the following procedure:
- 52 1. Flushing sequence for closed water systems is as follows:
- 53 a. Close isolation valves at coils and wall fin.
- 54 b. Open temporary bypasses that connect ends of supply and return mains.
- 55 c. Flush mains by turning on flushing water source and sequentially opening drains on
- 56 mains on each floor until discharge is clean. This will flush mains without forcing
- 57 water or debris into branches and run out pipes.

- 1 d. Close isolation valves located downstream of coils and wall fin.
2 e. Open isolation valves located upstream of coils and wall fin.
3 f. Open individual drain valves upstream of coil and /wall fin until discharge is clean.
4 This will flush supply branch and run out lines between mains and coils/wall fin
5 without running water or debris through TCV or coils and wall fin.
6 g. Close individual drain valves upstream of coils and wall fin.
7 h. Open drain valves at low points in return piping mains.
8 i. Open individual isolation valves located downstream of coils and wall fin. This will
9 flush return branch and run out lines located between coils and wall fin and mains back
10 into mains and out drains on return mains. Water going through coils and wall fin
11 should already be clean since this section was flushed previously.
12 j. Repeat steps 1-3 to clean debris from mains.
13 2. Flushing sequence for open water systems is as follows:
14 a. Open temporary bypasses that connect ends of supply and return mains.
15 b. Flush mains by turning on flushing water source and sequentially opening drain valves.
16
17 P. Isolate coils while flushing risers and mains.
18
19 Q. Flush mains on each floor individually, starting at top of building and working down towards basement
20 level.
21
22 R. After risers and mains have been flushed clean, individually open drain valves in each branch circuit to
23 discharge any debris that may have accumulated in branch piping.
24
25 S. Contractor is required to open drain valves at selected locations in system to verify effectiveness of
26 flushing procedures as directed by Engineer, Owner's Representative or Construction Manager.
27
28 T. If sediment or debris is identified in system, flush system again and re-inspect at no expense to Owner.
29
30 U. After flushing operations are complete, drain and blow out any residual water, clean or replace strainers,
31 and add scale and corrosion inhibitors. Leave flushing connections and valves in place and cap.
32
33 V. Document flushing procedures by completing and submitting report form included at end of this Section.
34
35 3.10 INITIAL FILL AND VENT
36
37 A. Fill hydronic systems with appropriate working fluids as specified.
38
39 B. For closed piping systems, relieve air trapped at high points through manual air vents prior to notifying
40 Engineer and Owner's Representative that systems are ready to testing and balancing.
41
42

END OF SECTION 23 21 13

PIPING SYSTEM LEAKAGE TEST REPORT

Date Submitted: _____

Project Name: _____

Location: _____ Project No: _____

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: _____

1 **PIPING SYSTEM FLUSHING REPORT**

2
3 **Date**
4 **Submitted:** _____

5
6 **Project Name:** _____

7
8 **Location:** _____ **Project No:** _____

9
10 **Contractor:** _____

11 **System Identification (check one):**

- 12 Chilled Water Process Chilled Water Heat Reclaim
13 Heating Hot Water Other _____

14 **Describe procedure:** _____

15 _____
16 _____
17 _____
18 _____
19 **Flush Date:** _____ **Start Time:** _____ **Stop Time:** _____

20 **Pressure of Water Source:** _____ **PSIG**

21 **Describe water source and method of connection to source:** _____

22 _____
23 _____
24 _____
25 **Flushed By:** _____ **Witnessed By:** _____

26 **Title:** _____ **Title:** _____

27 _____
28 **Company:** _____ **Agency:** _____

29 _____
30 **Signed:** _____ **Signed:** _____

31 _____
32 **Date:** _____ **Date:** _____

33 **Describe results:** _____

34 _____
35 _____

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SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. High pressure ductwork.
2. Low pressure ductwork.
3. Duct sealant.
4. Gaskets.
5. Pressure sensitive tapes.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 00 - Basic HVAC Requirements.
3. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
4. Section 23 07 00 – HVAC Insulation.
5. Section 23 33 00 – Air Duct Accessories.

1.02 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI SS-EN 485-2 - Aluminum and Aluminum Alloys-Sheet, Strip and Plate-Part 2: Mechanical Properties.

B. ASTM International (ASTM):

1. ASTM A90 - Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
2. ASTM A167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. ASTM A527 - Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
4. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
5. ASTM A924 - Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Method.
6. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
7. ASTM C411 - Test Method for Hot Surface Performance of High Temperature Thermal Insulation.
8. ASTM C916 - Specification for Adhesives for Duct Thermal Insulation.
9. ASTM C1071 - Specification for Fibrous Glass Duct Lining Insulation.
10. ASTM C1338 - Test Method for Determining Fungal Resistance of Insulation Materials and Facings.
11. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
12. ASTM G21 - Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. National Fire Protection Association (NFPA):

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
2. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

D. North American Insulation Manufacturers Association (NAIMA):

1. NAIMA - Fibrous Glass Duct Liner Standard.

1 E. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

2
3 F. Underwriters Laboratories, Inc. (UL):

4 1. UL 181 - Standard for Safety for Factory Made Air Ducts and Air Connectors.

5
6 1.03 SUBMITTALS

7
8 A. Division 01 – General Requirements: Requirements for submittals. Shop drawings, product data and
9 samples.

10 B. Submit manufacturer's data and Contractor data for the following:

11 1. Fabrication and installation drawings.

12 2. Schedule of duct systems including material of construction, gauge, pressure class, system class,
13 method of reinforcement, joint construction, fitting construction, and support methods, with details
14 as appropriate.

15 3. Duct sealant and gasket material.

16 4. Duct liner including data on thermal conductivity, air friction correction factor, and limitation on
17 temperature and velocity.

18 5. Kitchen exhaust ductwork.

19 6. Underground ductwork.

20 7. Pressure sensitive tape.

21
22
23 1.04 DESIGN CRITERIA

24
25 A. Construct ductwork to be free from vibration, chatter, objectionable pulsations, and leakage under
26 specified operating conditions.

27
28 B. Use material, weight, thickness, gauge, and construction and installation methods as outlined in the
29 following Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) publications,
30 unless noted otherwise:

31 1. HVAC Duct Construction Standards, Metal and Flexible, Latest Edition.

32 2. HVAC Air Duct Leakage Test Manual, Latest Edition.

33 3. HVAC Systems - Duct Design, Latest Edition.

34 4. Rectangular Industrial Duct Construction Standard, Latest Edition.

35 5. Round Industrial Duct Construction Standards, Latest Edition.

36 6. Thermoplastic Duct (PVC) Construction Manual, Latest Edition.

37 7. Round Industrial Duct Construction Standards, Latest Edition.

38 8. Rectangular Industrial Duct Construction Standards, Latest Edition.

39
40 C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke
41 developed rating no higher than 50.

42
43 1.05 DELIVERY, STORAGE AND HANDLING

44
45 A. Promptly inspect shipments to ensure that ductwork is undamaged and complies with specification.

46 B. Protect ductwork against damage.

47 C. Protect ductwork by storing inside or by durable, waterproof, above ground packaging.

48
49 D. Do not store material on grade. Protect ductwork from dirt, dust, construction debris, and foreign
50 material.

51 E. Where end caps or packaging are provided, take precautions so caps or packaging remain in place and
52 free from damage.

53
54 F. Offsite storage agreements do not relieve Contractor from using proper storage techniques.

1
2 G. Storage and protection methods must allow inspection to verify products.
3

4 PART 2 - PRODUCTS

5
6 2.01 GENERAL
7

8 A. Sheet metal used for construction of duct shall be 24-gauge or heavier except for round and spiral
9 ductwork and spiral duct take-offs 12-inch and below may be 26-gauge where allowed in SMACNA
10 HVAC Duct Construction Standards, Metal and Flexible, latest edition.

11 B. Duct sizes indicated on Drawings are net inside dimensions. Where duct liner is specified, dimensions
12 are net, inside of liner.
13

14
15 2.02 DUCTWORK PRESSURE CLASS
16

17 A. Minimum acceptable duct pressure class, for ductwork except transfer ductwork, is 2-inch W.G. positive
18 or negative, depending on application.
19

20 B. Transfer ductwork minimum acceptable duct pressure class is 1-inch W.G. positive or negative,
21 depending on application.
22

23 C. Duct system pressure classes not indicated on Drawings to be as follows:
24

<u>Duct System</u>	<u>Pressure Class</u>
Supply duct upstream of VAV boxes	3 inch pressure class
Supply duct downstream of VAV terminals	2 inch pressure class
Transfer ducts	1 inch pressure class
Exhaust ducts	2 inch pressure class
Return ducts	2 inch pressure class
Other duct systems	2 inch pressure class

25
26
27
28
29
30
31
32
33
34 2.03 MATERIALS
35

36 A. Galvanized Steel Sheet:

- 37 1. ASTM A653, galvanized steel sheet of lock forming quality.
- 38 2. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with
39 ASTM A90.
- 40 3. Provide "paint grip" finish or galvanneal sheet metal for ductwork that will be painted.
41

42 B. Uncoated Black Steel Sheet:

- 43 1. First quality, soft steel sheet capable of welding or double seaming without fracture.
44

45 C. Aluminum Sheet:

- 46 1. Use ASTM B209 Aluminum sheet, Alloy 3003H-14, capable of double seaming without fracture.
47

48 D. Stainless Steel Sheet:

- 49 1. Use ASTM A167, Type 304 or 316 stainless steel sheet as specified, 316L if welded ductwork,
50 with No. 2B finish for concealed work and No. 3 finish for exposed work.
51

52 E. Polyvinyl Chloride Coated Steel Sheet:

- 53 1. Use hot-dipped galvanized steel sheet with prime coat and a polyvinyl chloride film on both sides.
- 54 2. Thickness of coating to be a minimum of 4 mils on each side.
- 55 3. Contractor, at their option, may use United Sheet Metal Uni-Coat, made by United McGill Co.
- 56 4. Where any duct surface is scratched, marred, or otherwise damaged, paint with PVC aerosol spray.
- 57 5. Couplings shall be slip-joint construction with a minimum 2 inches insertion length.

1 6. Seal couplings with sealants as specified.

2
3 2.04 HIGH PRESSURE DUCTWORK (PRESSURE CLASS 4-INCH AND OVER)

4
5 A. Manufacturers:

- 6 1. Ajax.
7 2. Semco.
8 3. United Sheet Metal.
9 4. Equivalent as acceptable to Engineer.

10
11 B. Machine formed round and flat oval spiral lock seam duct constructed of galvanized steel.

12
13 C. Rectangular high pressure duct using a transverse joint system; duct shall be flanged, gasketed, and
14 sealed:

- 15 1. Manufacturers:
16 a. Ductmate.
17 b. Nexus.
18 c. TDC.
19 d. TDF.
20 e. Equivalent as acceptable to Engineer.

21
22 D. Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval
23 of Engineer/Architect.

24
25 E. Submit construction details, description of materials to be used, type of service, reinforcing methods, and
26 sealing procedures.

27
28 F. Use a perforated inner liner on double wall high-pressure duct. Annular space between inner liner and
29 outer duct to be filled with one-inch glass fiber insulation. Use solid liner for healthcare applications.

30
31 G. Use cemented slip joints with two-inch minimum overlap, flanged connections, or welded/brazed
32 connections, unless noted otherwise for special applications. Prime coat welded joints.

33
34 H. Provide standard 90-degree conical tee takeoffs except for exhaust at velocities over 2000 feet per
35 minute, use 45-degree lateral connections.

36
37 I. Straight taps or bullhead tees are not acceptable.

38
39 J. Internal bracing will not be accepted on ductwork below 48 inches.

40
41 K. Use turning vanes as specified in Section 23 33 00 – Air Duct Accessories.

42
43 L. Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.

44
45 M. Provide pressure relief fittings as indicated on Drawings and details.

46
47 N. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

48
49 2.05 LOW PRESSURE DUCTWORK (MAXIMUM 3-INCH PRESSURE CLASS)

50
51 A. Fabricate and install ductwork in sizes indicated on Drawings and in accordance with SMACNA
52 recommendations, except as modified below.

53
54 B. Construct so that interior surfaces are smooth.

55
56 C. Use slip and drive or flanged and bolted construction when fabricating rectangular ductwork.

- 1 D. Use spiral lock seam construction when fabricating round spiral ductwork.
- 2
- 3 E. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved
- 4 locations if screw does not extend more than 1/2-inch into duct.
- 5
- 6 F. Use elbows and tees with centerline radius to width or diameter ratio of 1.5 wherever space permits.
- 7
- 8 G. When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in
- 9 accordance with SMACNA, Type RE 3.
- 10
- 11 H. Where space will not allow and C value of radius elbow, as given by SMACNA, exceeds 0.31, use
- 12 rectangular elbows with turning vanes as specified in Section 23 33 00 – Air Duct Accessories.
- 13
- 14 I. Square throat-radius heel elbows shall not be acceptable. Straight taps or bullhead tees are also not
- 15 permitted.
- 16
- 17 J. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00 – Air
- 18 Duct Accessories.
- 19
- 20 K. Provide expanded take-offs or 45-degree entry fittings for branch duct connections with branch ductwork
- 21 airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps are
- 22 unacceptable.
- 23
- 24 L. Button punch snaplock construction will not be accepted on aluminum ductwork.
- 25
- 26 M. Contractor may substitute round ducts for rectangular ducts if sized in accordance with ASHRAE table of
- 27 equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by
- 28 written permission of [Engineer/Architect] [Engineer] [Owner's Representative].
- 29
- 30 N. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence
- 31 upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45
- 32 degrees.
- 33

34 2.06 DUCT SEALANT

- 35
- 36 A. Manufacturers:
- 37 1. 3M 800.
- 38 2. 3M 900.
- 39 3. H.B. Fuller/Foster.
- 40 4. Hardcast.
- 41 5. Hardcast Peel & Seal.
- 42 6. Lockformer Cold Sealant.
- 43 7. Mon-Eco Industries.
- 44 8. United Sheet Metal.
- 45 9. Equivalent as acceptable to Engineer.
- 46
- 47 B. Silicone sealants will not be allowed in any type of ductwork installation.
- 48
- 49 C. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to
- 50 temperature limitations.
- 51
- 52 D. Allow sealant to fully cure before pressure testing of ductwork or startup of air handling systems.
- 53

54 2.07 GASKETS

- 55
- 56 A. Two-Inch Pressure Class and Lower: Soft neoprene or butyl gaskets in combination with duct sealant for
- 57 flanged joints.

1
2 B. Three-Inch Pressure Class and Higher: Butyl gaskets.
3

4 2.08 PRESSURE SENSITIVE TAPES
5

6 A. Two-inch Pressure Class and Lower: UL-181A-P listed and labeled for rigid ductwork. UL-181B-FL
7 listed and labeled for flexible duct applications.
8

9 B. Tape is not permitted on any hazardous ductwork including kitchen exhaust or fume exhaust ductwork.
10

11 C. Unlisted duct tape is not permitted as a sealant on any duct.
12

13 PART 3 - EXECUTION
14

15 3.01 INSTALLATION
16

17 A. Verify dimensions at site, making field measurements and drawings necessary for fabrication and
18 erection.
19

20 B. Check Drawings showing work of other trades and consult with Engineer/Architect in event of any
21 interference.
22

23 C. Make allowances for beams, pipes, or other obstructions in building construction and for work of other
24 contractors.
25

26 D. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction
27 Standards, Figure 2-7, except do not reduce duct to less than 6 inches in any dimension and do not exceed
28 an 8:1 aspect ratio.
29

30 E. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated
31 in SMACNA HVAC Duct Construction Standards, Figure 2-8, Fig. E.
32

33 F. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure
34 or fume exhaust ductwork.
35

36 G. Test openings for test and balance work will be provided under Section 23 05 93 - Testing, Adjusting,
37 and Balancing for HVAC.
38

39 H. Provide frames constructed of angles or channels for coils, filters, dampers, or other devices installed in
40 duct systems, and make connections to such equipment including equipment furnished by others. Secure
41 frames with gaskets and screws or nut, bolts, and washers.
42

43 I. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to
44 form watertight joints.
45

46 J. Where two different metal ducts meet, install joint in such a manner that metal ducts do not contact each
47 other by using proper seal or compound.
48

49 K. Install motor operated dampers and connect to or install equipment furnished by others. Blank off unused
50 portions of louvers, as indicated on Drawings, with 1-1/2-inch board insulation with galvanized sheet
51 metal backing on both sides.
52

53 L. Do not install ductwork through dedicated electrical rooms or spaces unless ductwork is serving this room
54 or space.
55

56 M. Locate ducts with sufficient space around equipment to allow normal operating and maintenance
57 activities.

- 1
2 N. Provide adequate access to ductwork for cleaning purposes.
3
4 O. Provide temporary capping of ductwork openings to prevent entry of dirt, dust, and foreign material.
5
6 P. Protect diffusers, registers, and grilles with plastic wrap or some other approved form of protection to
7 maintain dirt and dust free and to prevent entry of dirt, dust, and foreign material into ductwork.
8
9 Q. During construction provide temporary closures of metal or taped polyethylene on open ductwork to
10 prevent construction dust from entering ductwork system.
11
12 R. Provide duct access doors or cleanout doors on all exhaust ductwork and return air ductwork at 20 foot
13 intervals for healthcare applications.
14

15 3.02 DUCTWORK SUPPORT

- 16 A. Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5.5, except
17 supporting ductwork with secure wire method is not allowed.
18
19 B. Support with 3/32-inch, 7-inch x 7-inch, stainless steel air-craft cable, with matching fastener rated for
20 150 percent of actual load, will be allowed on round ductwork under 12 inches if installed as detailed,
21 with cable double looped on duct and at point of support.
22
23

24 3.03 LOW PRESSURE DUCT (MAXIMUM 3-INCH PRESSURE CLASS)

- 25 A. Seal ducts, with exception of transfer ducts, in accordance with SMACNA seal class "A"; sealing
26 transverse and longitudinal seams, joints, and penetrations.
27
28 B. Install a manual-balancing damper in each branch duct and for each diffuser or grille. Use of splitter
29 dampers, extractors, or grille face dampers will not be accepted for balancing dampers.
30
31 C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheet metal
32 screws or pop rivets. Trapeze hangers may be used at Contractor's option.
33
34

35 3.04 HIGH PRESSURE DUCT (PRESSURE CLASS 4-INCH AND OVER)

- 36 A. Seal duct in accordance with SMACNA Seal Class "A"; sealing seams, joints, and penetrations.
37
38

39 3.05 CLEANING

- 40 A. Remove dirt and foreign matter from entire duct system and clean diffusers, registers, grilles, and inside
41 of air-handling units before operating fans.
42
43 B. Clean duct systems with high power vacuum machines where systems have been used for temporary heat,
44 air-conditioning, or ventilation purposes during construction.
45
46 C. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.
47
48

49 3.06 LEAKAGE TEST

- 50 A. Test ductwork in accordance with test methods described in Section 5 of SMACNA HVAC Air Duct
51 Leakage Test Manual.
52
53 B. Do not insulate ductwork until it has been successfully tested. Test pressure shall be equal to duct
54 pressure class.
55
56 C. If excessive air leakage is found locate leaks, repair duct in area of leak, seal duct, and retest.
57

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- D. Leakage rate shall not exceed more than 5 percent of system air quantity for low-pressure ductwork, determined in accordance with Appendix C of SMACNA HVAC Air Duct Leakage Test Manual.
- E. Leakage rate shall not exceed more than 1 percent of system air quantity for high-pressure ductwork, determined in accordance with Appendix C of SMACNA HVAC Air Duct Leakage Test Manual.
- F. Contractor may omit leakage test for ductwork downstream of air terminal devices but will not relieve Contractor from duct sealing requirements.
- G. Submit a signed report to Engineer/Architect and Owner's Representative indicating test apparatus used, results of leakage test, and any remedial work required to bring duct systems into compliance with specified leakage rates.

3.07 STRUCTURAL TEST

- A. Random test ductwork per Engineer/Architect's direction. Do not insulate ductwork until it has been successfully tested. Test pressure shall be equal to duct pressure class.
- B. Deflection limits shall not exceed those listed in accordance with Chapter 7 of SMACNA HVAC Duct Construction Standards, 3.0 Performance Requirements.
- C. Submit a signed report to Engineer/Architect indicating test apparatus used, results of structural test, and any remedial work required.

(DUCT LEAKAGE TEST REPORT) Next Page

DUCT LEAKAGE TEST REPORT

GRAEF Project Number: _____
Date Submitted: _____

Project	Name: _____		
	Location: _____		
	Contractor: _____		
System	Fan No: _____	Leakage Class (C _L): _____	
Data	Fan Design CFM: _____	Duct Pressure Class (P _C): _____	
		Test Pressure (P _T): _____	
Test			
Equipment	Manufacturer: _____	Model No: _____	Serial No: _____

For large systems, use reverse side for a simple sketch of entire duct system. Use letter designations to indicate various duct sections being tested at one time. Use reverse side for test comments.

Note that due to normal construction sequencing it is usually necessary to test risers separately prior to enclosing chases.

Design Data					Field Test Data							
Duct Section	Duct Shape	Duct Surface (Ft ²)	Allowable Leakage		Diameter		Pressure (in. wc.)		Date	Performed By	Observed By	Actual CFM
			Leakage Factor (P ^{.65} C _L)	CFM for Section	Tube (D ₁)	Orifice (D ₂)	In Duct (P)	Across Orifice (P _{drop})				
TOTAL												

Duct Structural Test Report

GRAEF Project Number: _____ Date Submitted: _____
--

Proj ect	Name: _____ Location: _____ Contractor: _____
System Data	Fan No: _____ Description of Test Method: _____ _____ _____
Test Equipment	Manufacturer: _____ Model Serial No: _____ <div style="text-align: right;">No: _____</div>

For large systems, use reverse side for a simple sketch of entire duct system. Use letter designations to indicate various sections being tested at one time. Use reverse side for test comments.
 Note that due to normal construction sequencing it is usually necessary to test risers separately prior to enclosing chases.

Design Data								Field Test Data						
Duct Test Loca tion	Ductwork Shape		Duct Pressure Class	Allowable Ductwork Wall Deflection		Allowable Joint/ Reinforcement Deflection		Pressure (in. wc.) In Duct	Measured Ductwork Wall Deflection		Measured Joint/ Reinforcement Deflection		Per- formed By/ Date	Wit- nessed By/ Date
	H	W		H	W	H	W		H	W	H	W		

1
2

END OF SECTION 23 31 00

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Turning vanes.
3. Gravity backdraft dampers.
4. Fire dampers.
5. Smoke dampers and combination fire/smoke dampers.
6. Flexible duct.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 00 – Basic HVAC Requirements.
3. Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment.
4. Section 23 09 13 – Instrumentation and Control Devices for HVAC.
5. Section 23 09 23 – Direct Digital Control System for HVAC.
6. Section 23 31 00 – HVAC Ducts and Casings.

1.02 REFERENCES

A. Air Movement & Control Association International, Inc. (AMCA):

1. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.

B. ASTM International (ASTM):

1. ASTM C411 – Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
2. ASTM C916 - [Specification for Adhesives for Duct Thermal Insulation](#).
3. ASTM C1071 – Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
4. ASTM C1338 – [Test Method for Determining Fungi Resistance of Insulation Materials and Facings](#).
5. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM G21 - Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. National Fire Protection Association (NFPA):

1. NFPA 90A - Standard for Installation of Air Conditioning and Ventilating Systems.

D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. SMACNA - HVAC Duct Construction Standards - Metal and Flexible, Latest Edition.

E. Underwriters Laboratories, Inc. (UL):

1. UL 181 – Standard for Factory-Made Air Ducts and Air Connectors
2. UL 214 - Test for Flame-Propagation of Fabrics and Films.
3. UL 555 - Standard for Fire Dampers and Ceiling Dampers.
4. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

1.03 SUBMITTALS

A. Division 01 - Submittal Procedures: Shop Drawings, product data, and samples.

- 1
2 B. Submittals for accessories shall include dimensions, capacities, ratings, installation instructions, and
3 appropriate identification.
4
5 C. Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic
6 performance of sound attenuators.
7
8 D. Fire damper and smoke damper submittals shall include free area data, certified pressure drop data and
9 leakage data for sizes used.
10
11 E. Include performance data for air blenders.
12
13 F. Submit manufacturer's color charts where finish color is to be selected by Engineer/Architect.
14

15 PART 2 - PRODUCTS

16
17 2.01 MANUAL VOLUME DAMPERS
18

- 19 A. Manufacturers:
20 1. Ruskin.
21 2. Vent Products.
22 3. Air Balance.
23 4. Pottorff.
24 5. Greenheck.
25 6. Equivalent as acceptable to Engineer.
26
27 B. Construct dampers in accordance with SMACNA HVAC Duct Construction Standards Fig. 7-4, Fig. 7-5,
28 and notes relating to these figures, except as modified below.
29
30 C. Reinforce blades to prevent vibration, flutter, or other noise.
31
32 D. Construct dampers in multiple sections with mullions where width is over 48 inches.
33
34 E. Use rivets or tack welds to secure individual components; sheet metal screws are unacceptable.
35
36 F. Provide operators with locking devices and damper position indicators for each damper; use an elevated
37 platform on insulated ducts.
38
39 G. Provide end bearings or bushings for volume damper rods penetrating ductwork constructed to a 3-inch
40 water column pressure class or above.
41

42 2.02 TURNING VANES
43

- 44 A. Manufacturers:
45 1. Aero Dyne
46 2. Ductmate Industries.
47 3. Duro Dyne.
48 4. Airsan Corp.
49 5. Equivalent as acceptable to Engineer.
50
51 B. Construct turning vanes and runners for square elbows in accordance with SMACNA HVAC Duct
52 Construction Standards Fig. 4-3 and Fig. 4-4, except use only airfoil type vanes.
53
54 C. Construct turning vanes for short radius elbows and elbows where one dimension changes in turn in
55 accordance with SMACNA HVAC Duct Construction Standards Fig. 4-4 and Fig. 4-9.
56

1 2.03 GRAVITY BACKDRAFT DAMPERS

2
3 A. Manufacturers:

- 4 1. Ruskin Model CBD4 or equivalent
- 5 2. Air Balance
- 6 3. Advanced Air
- 7 4. Cesco
- 8 5. American Warming and Ventilating
- 9 6. Vent Products Company, Inc.
- 10 7. Greenheck
- 11 8. Arrow
- 12 9. Pottorff
- 13 10. Equivalent as acceptable to Engineer.

14
15 B. Dampers shall be adjustable type, counterbalanced, self-acting, multiple bladed backdraft air dampers of
16 sizes indicated or required.

17
18 C. Dampers shall begin to open in the desired direction of airflow when the upstream to downstream
19 differential static pressure reaches approximately 0.05 to 0.10 inches of water column.

20
21 D. Blades shall be constructed of 0.070 inch thickness aluminum with a 6 inch maximum blade width,
22 interlocking neoprene or extruded vinyl blade edge seals, dust proof ball bearing shaft supports,
23 interconnecting linkage and adjustable counterbalancing weights.

24
25 E. Frame shall be constructed of 0.081 thickness extruded aluminum.

26
27 2.04 FIRE DAMPERS

28
29 A. Manufacturers:

- 30 1. Air Balance
- 31 2. Advanced Air
- 32 3. American Warming and Ventilating
- 33 4. Prefco
- 34 5. Ruskin
- 35 6. Safe-Air
- 36 7. Vent Products
- 37 8. Pottorff
- 38 9. Greenheck
- 39 10. Equivalent as acceptable to Engineer.

40
41 B. Static Fire Dampers

- 42 1. Static fire damper assemblies must be UL 555 listed and labeled for static applications, where air
43 systems do not operate during a fire and meet requirements of NFPA 90A.
- 44 2. Damper must be type B curtain type with blades out of air stream; dampers with blades in air
45 stream are unacceptable. Damper blades in air stream may be used in transfer ducts.
- 46 3. Damper fire rating to be compatible with rating of building assembly in which damper is used.

47
48 C. Dynamic Fire Dampers

- 49 1. Dynamic fire damper assemblies must be UL 555 listed and labeled for dynamic applications,
50 where air systems operate during a fire, and meet requirements of NFPA 90A.
- 51 2. Dampers must be type B curtain type with curtain 100 percent out of air stream.
- 52 3. Dampers larger than 30 x 30-inch or with velocity rating requirements of 3000 fpm or higher, may
53 be multi-blade type with blades located in airstream.
- 54 4. Velocity ratings and static pressure ratings as indicated on Drawings.
- 55 5. Damper fire rating to be compatible with rating of building assembly in which damper is used.

56

1 D. Provide fusible links rated at 165 degrees F, unless noted otherwise on Drawings.

2
3 2.05 SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS

4
5 A. Manufacturers:

- 6 1. Ruskin
- 7 2. Air Balance
- 8 3. Advanced Air
- 9 4. American Warming and Ventilating
- 10 5. Greenheck
- 11 6. Safe-Air
- 12 7. Prefco
- 13 8. Pottorff
- 14 9. Equivalent as acceptable to Engineer.

15
16 B. Smoke damper assemblies to be UL 555S listed and labeled, and leakage rated at no higher than Class II
17 under UL 555S. Unless ratings are indicated elsewhere, dampers should be rated for minimum 2,000 fpm
18 air velocity and 4-inch static pressure.

19
20 C. Smoke damper air pressure drop shall not exceed 0.15 inches W.C. for matching duct size. Increase
21 damper sizes 2 inches larger where installed in ductwork 12 inches and smaller.

22
23 D. Combination fire/smoke damper assemblies to be UL 555 and UL 555S listed and labeled, and have fire
24 rating compatible with rating of building assembly in which damper is used, and be leakage rated at no
25 higher than Class II under UL 555S.

26
27 E. Provide factory installed electrically operated dampers with linkage arranged so that damper closes on
28 loss of power.

29
30 F. Provide with heat-actuated release device rated at 165 degrees F, unless noted otherwise on Drawings.

31
32 G. For electric actuation, provide electric operated dampers with linkage and UL listed operators arranged so
33 damper closes on a loss of power.

34
35 H. Where DDC system controls electric actuation, use 0-10 VDC inputs, with stall protection, and with and
36 zero and span adjustments for modulating or 24 VAC for two-position control.

37
38 I. Provide electric actuators with overload protection to prevent motor from damage when encountering
39 stall condition. Locate operators out of air stream unless large damper size will not allow.

40
41 J. Provide form "C" end switches to indicate damper position.

42
43 2.06 CONTROL DAMPERS

44
45 A. Control dampers are specified in Section 23 09 13 - Instrumentation and Control Devices for HVAC.

46
47 2.07 SMOKE DETECTORS

48
49 A. Electrical Contractor shall furnish and install smoke detectors.

50
51 2.08 FLEXIBLE DUCT

52
53 A. Manufacturers:

- 54 1. Anco Products
- 55 2. Clevaflex
- 56 3. Thermaflex

- 1 4. Flexmaster
- 2 5. Equivalent as acceptable to Engineer.

- 3
- 4 B. Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and smoke developed rating of 50 or less under in accordance with NFPA 90A.
- 5
- 6
- 7 C. Suitable for pressures and temperatures involved but not less than a 180 degrees F service temperature
- 8 and plus or minus 2-inch pressure class, depending on application.
- 9
- 10 D. Duct to be composed of polyester film, aluminum laminate, or woven and coated fiberglass fabric bonded
- 11 permanently to corrosion resistant coated steel wire helix. Fabricator may use two-ply, laminated, and
- 12 corrugated aluminum construction.
- 13
- 14 E. Where specifying insulated duct, provide a minimum 1-inch fiberglass insulation blanket with maximum
- 15 thermal conductance of 75 degrees F and vapor barrier jacket of polyethylene or metalized reinforced
- 16 film laminate. Maximum perm rating of vapor barrier jacket to be 0.1-perm.
- 17

18 PART 3 - EXECUTION

19 3.01 MANUAL VOLUME DAMPERS

- 20
- 21
- 22 A. Install manual volume dampers in each branch duct and each grille, register, or diffuser as far away from
- 23 outlet as possible while still maintaining accessibility to damper.
- 24
- 25 B. Install so there is no flutter or vibration of damper blades.
- 26
- 27 C. Splitter dampers shall not be used in place out volume dampers.
- 28

29 3.02 TURNING VANES

- 30
- 31 A. Install turning vanes in rectangular, mitered elbows in accordance with SMACNA standards and
- 32 manufacturer's recommendations.
- 33
- 34 B. Install double wall, airfoil, 2-inch radius vanes in ducts with vane runner length 18 inches or greater and
- 35 air velocity less than 2000 fpm.
- 36
- 37 C. Install double wall, airfoil, 4-1/2-inch radius vanes in ducts with vane runner length greater than 18
- 38 inches and air velocity 2000 fpm or greater.
- 39
- 40 D. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension.
- 41
- 42 E. If duct size changes in radius elbow or if short radius elbows must be used, install sheet metal turning
- 43 vanes in accordance with SMACNA HVAC Duct Construction Standards Figure 4-4 and Figure 4-9.
- 44
- 45 F. Install duct access doors upstream of fittings with turning vanes to facilitate cleaning.
- 46

47 3.03 GRAVITY BACKDRAFT DAMPERS

- 48
- 49 A. Install at locations indicated on drawings.
- 50
- 51 B. Install access door for service and access to the damper.
- 52
- 53 C. Adjust counterbalance weight for proper operation.
- 54

55 3.04 FIRE DAMPERS

- 1 A. Install dampers in strict accordance with manufacturer's installation instructions.
- 2
- 3 B. Install damper sleeves with retaining angles on both sides of rated partition.
- 4
- 5 C. Connect ductwork to fire damper assemblies as specified in installation instructions.
- 6
- 7 D. Where it is necessary to set dampers out from rated wall, install a sleeve extension encased in two-hour
- 8 rated fire proofing insulation.
- 9
- 10 E. Install an access door at each fire damper, located to permit resetting damper and replacing fusible link.
- 11
- 12 F. Manually test each fire damper for proper operation by removing fusible link. Repair or replace any fire
- 13 damper that does not close completely. Re-install fusible link after test.
- 14
- 15 G. Label all fire dampers per Section 23 05 00 – Basic HVAC Requirements.
- 16

17 3.05 SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS

18

- 19 A. Install smoke dampers in locations indicated on Drawings in accordance with manufacturer's instructions.
- 20
- 21 B. Install access door adjacent to each damper for inspection and cleaning. Coordinate damper linkage with
- 22 operators so damper closes when air system is not operating.
- 23
- 24 C. Install combination fire/smoke dampers as specified above for fire dampers. Coordinate damper linkage
- 25 with operators so damper closes when air system is not operating.
- 26
- 27 D. Label all dampers per section 23 05 00 – Basic HVAC Requirements.
- 28

29 3.06 SMOKE DETECTORS

30

- 31 A. Electrical Contractor shall install and wire detectors. Install an access door at each detector location.
- 32

33 3.07 FLEXIBLE DUCT

34

- 35 A. Only use flexible duct for final connections of air inlets and outlets at diffuser, register, and grille
- 36 locations.
- 37
- 38 B. Use minimum length of flexible duct required to make final connections, but no greater than 5 feet in
- 39 length with no more than one (1) 90-degree bend.
- 40
- 41 C. Secure inner jacket of flexible duct in place with stainless steel metal band clamp.
- 42
- 43 D. Secure insulation vapor barrier jacket in place with steel or nylon draw band. Sheet metal screws and
- 44 duct tape are unacceptable.
- 45
- 46 E. Use of flexible duct to compensate for misalignment of main duct or branch duct is unacceptable.
- 47
- 48 F. Individual sections of flexible ductwork shall be of one-piece construction. Splicing of short sections is
- 49 unacceptable.
- 50
- 51 G. Size flexible ductwork used as transfer duct for a maximum velocity of 300 fpm.
- 52
- 53 H. Penetration of any partition, wall, or floor with flexible duct is unacceptable.
- 54
- 55

END OF SECTION 23 33 00

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Single duct terminal boxes.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 00 – Basic HVAC Requirements.
3. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.
4. Section 23 07 00 – HVAC Insulation.
5. Section 23 09 13 - Instrumentation and Control Devices for HVAC.
6. Section 23 09 23 – Direct Digital Control System for HVAC.

1.02 REFERENCES

A. Air-Conditioning, Heating and Refrigeration Institute (AHRI):

1. AHRI Standard 880 – Performance Rating of Air Terminals.

B. National Fire Protection Association (NFPA):

1. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

C. Underwriters Laboratories, Inc. (UL):

1. UL 181 - Factory-Made Air Ducts and Connectors.
2. UL 723 – Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Division 01 – General Requirements: Requirements for submittals: Shop drawings, product data and samples.

B. Contractor shall submit air terminal unit data including materials of construction, dimensions, scheduled flow rates, pressure drops, heating coil data and capacities, and radiated and discharge sound power levels.

C. Submit fan data for fan powered units, electrical data for fan powered units, including power and control wiring diagrams.

D. Submit with individual unit identification by area served in tabular form.

E. Submittals that do not include pressure drop and sound data will be rejected and returned.

1.04 DESIGN CRITERIA

A. Select sizes, capacities, configuration, and operating characteristics as shown on Drawings and as scheduled.

B. The units shall have adjustable minimum and maximum CFM limiting devices. Scheduled maximum air volumes shall not exceed 75 percent of nominal unit airflow.

- 1 C. At 1.0 inch inlet static pressure, total sound power shall not exceed NC 35 db, re 10^{-12} watts based on an 8
2 db room effect, a 10 db ceiling transmission loss and assuming attenuation from 5 feet of lined duct and
3 slot diffuser on discharge.

4
5 PART 2 - PRODUCTS

6
7 2.01 SINGLE DUCT TERMINAL BOXES

- 8
9 A. Units shall be single duct and pressure independent.

10 B. Manufacturers

- 11 1. Nailor.
12 2. Price Industries.
13 3. MetalAire.
14 4. Titus.
15 5. Substitutions in accordance to Division 01 – General Requirements.

16
17
18 C. Construction:

- 19 1. Unit casing shall be minimum 22-gauge galvanized steel internally lined with 1-inch thick
20 fiberglass insulation with high density facing.
21 2. Construction to meet UL 181 and NFPA 90A.
22 3. Seal casing to limit leakage to a maximum of 15 cfm at 6.0 inches of static pressure.
23 4. Casing outlet shall have slip and drive joint for connection to discharge ductwork.
24 5. Mount metal damper blade to shaft having self-lubricated bearings.
25 6. Mark shaft end to indicate damper position and provide built-in stop to prevent over-stroking.
26 7. Damper blade shall close off against gasket to limit leakage to 10 cfm at 6.0 inches of differential
27 static pressure.
28 8. Size damper linkage to accept at least 40 inch-pounds of torque to damper shaft.
29 9. Provide damper shaft with a marking indicating damper position.
30 10. Casing shall have removable panels large enough to provide access for inspection, adjustment and
31 maintenance without disconnecting ducts. Panels shall be flush, gasketed airtight, and held in
32 place by screwdriver operated latches.
33 11. Equip round inlet collar with a multi-point flow sensor that amplifies measured velocity pressure.
34 12. Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire
35 retardant (FR) type.
36 13. Damper actuator and differential pressure sensor for flow measurements shall be provided by
37 Temperature Control Contractor. Provide NEMA-1 controls enclosure with access panel sealed
38 from air flow and mounted on side of unit.
39 14. Contractor shall fully coordinate with Section 23 09 13 – Instrumentation and Control Devices for
40 HVAC and Section 23 09 23 – DDC System to assure proper operation of equipment.

41
42 D. Reheat Coil:

43 1. Hot Water Reheat Coil:

- 44 a. Construct coils of copper tubes and aluminum fins in a serpentine arrangement with
45 piping connections on same end.
46 b. Provide galvanized steel casing, end supports, and top and bottom channels to
47 allowance for expansion of finned tube section.
48 c. Factory test coils at 200 psig.

49
50 E. Controls:

- 51 1. Electric Controls: Contain in NEMA-1 enclosure with access panel sealed from air flow and
52 mounted on side of unit.
53 2. Factory mount controls to accomplish the following specified sequence of operation.
54 3. Electronic Control, Central System Fan “On” – Occupied Mode:
55 a. When duct pressure is sensed indicating primary air system operating, thermostat and
56 primary variable volume damper proportions air flow from central system.

- 1 b. As thermostat senses reduced cooling demand, volume damper modulates to minimum
2 position.
- 3 c. At field adjustable point, unit fan is energized. [As cooling demand continues to fall,
4 volume damper remains at minimum position and fan speed increases.]
- 5 d. If central duct system pressure varies, volume damper maintains constant primary air
6 flow.
- 7 e. As thermostat senses no cooling requirement, control system maintains volume damper
8 at minimum position. Before heating is initiated, control enters field adjustable no load
9 band. On sensing need for heat, heating coil is energized [proportionally.] [in steps.]
- 10 4. Electronic Control, Central System Fan “Off” – Unoccupied Mode:
11 a. Provide field adjustable temperature setback. On need for heat, terminal unit fan and
12 heating coil are energized.
- 13 b. Hold volume damper closed.
- 14 5. Pneumatic and Electric Control, Central System Fan “On” – Occupied Mode:
15 a. As thermostat senses cooling, volume damper proportions air flow from central system.
16 b. As thermostat senses less cooling and damper modulates to minimum position, damper
17 position switch energizes fan.
- 18 c. Electronic fan speed control manually adjusts maximum fan speed to match
19 downstream resistance.
- 20 d. Velocity reset primary air control pressure independent with maximum and minimum
21 limits.
- 22 e. High-limit device, factory set, limits maximum primary air flow.
- 23 f. As thermostat senses no cooling, control system modulates volume damper to minimum
24 flow from central system primary air duct before heating is initiated. On sensing
25 further need for heat, heating coil is energized.
- 26 6. Pneumatic and Electric Control, Central System Fan “Off” – Unoccupied Mode:
27 a. Thermostat cycles fan.
- 28 b. Day/night thermostat cycles fan and controls at reduced temperature.
- 29 7. Thermostat:
30 a. Wall-mounted electric type with appropriate mounting hardware. Refer to Section
31 23 09 13 – Instrumentation and Control Devices for HVAC
- 32 8. Fully coordinate control requirement with successful Section 23 09 13 – Instrumentation and
33 Control Devices for HVAC. Contractor to assure compatible equipment installation and
34 communications.

36 PART 3 - EXECUTION

37 3.01 INSTALLATION

- 38 A. Install air terminal units as indicated on Drawings and in accordance with manufacturer’s installation
39 instructions.
- 40 B. Mount air terminal boxes with a minimum 3 feet of straight ductwork upstream of inlet flow sensor.
- 41 C. Provide duct access door in ductwork downstream of reheat coil.
- 42 D. Make duct access doors as large as duct allows with a maximum size of 18 x 18-inch.
- 43 E. Insulate reheat coils in accordance with Section 23 07 00 – HVAC Insulation.
- 44 F. For single duct and fan powered terminal units, provide five feet of duct lining immediately downstream
45 from terminal unit or reheat coil, if provided, per Section 23 07 00 – HVAC Insulation.
- 46 G. Support air terminal units from building structure using sheet metal straps or trapeze hanger with rods.

- 1 H. Support terminal units with hangar rods. Strap hangars are not acceptable.
- 2
- 3 I. Electrical Contractor will provide required line voltage power wiring.
- 4
- 5 J. Provide service clearance for removal of heating coils.
- 6
- 7 K. Locate units for ease of access to internal and external components requiring service operation or visual
- 8 examination.
- 9
- 10 L. Maintain code clearance requirements for electrical components. Provide at least 24 inches of clearance
- 11 on controller side of terminal unit.
- 12

13 3.02 ADJUSTING

- 14
- 15 A. Coordinate adjustment of air terminal units with section 23 05 93 - Testing, Adjusting and Balancing for
- 16 HVAC.
- 17

18 END OF SECTION 23 36 00

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ceiling diffusers.
2. Eggcrate grille.
3. Heavy duty side-wall return/exhaust grilles.

B. Related Sections:

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 23 05 00 - Basic HVAC Requirements.
3. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
4. Section 23 31 00 - HVAC Ducts and Casings.
5. Section 23 33 00 - Air Duct Accessories.

1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute (ARI)

1. ARI-ADC Standard 880.

B. ASTM International (ASTM)

1. ASTM D6386 - Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

C. National Fire Protection Association (NFPA)

1. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

D. Underwriters Laboratories, Inc. (UL)

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.03 SUBMITTALS

A. Division 01 – General Requirements – Submittal Procedures: Shop drawings, product data, and samples.

B. Furnish submittal information including, but not limited to, the following:

1. Manufacturer's name and model number.
2. Identification as referenced in documents.
3. Capacities/ratings.
4. Materials of construction.
5. Sound ratings.
6. Dimensions.
7. Finish.
8. Color selection charts where applicable.
9. Manufacturer's installation instructions.
10. Frame and border for each application.

1.04 DESIGN CRITERIA

A. Base performance data on tests conducted in accordance with Air Diffusion Council (ADC) Test Code 1062 GRD 84.

1
2 PART 2 - PRODUCTS
3

4 2.01 SQUARE CEILING DIFFUSERS - HIGH PERFORMANCE
5

6 A. Manufacturers:

- 7 1. Titus: Model TMS.
- 8 2. Carne: Series SF.
- 9 3. Price Industries: Model SCD.
- 10 4. MetalAire Series 5800.
- 11 5. Krueger Series 1400.
- 12 6. Equivalent as acceptable to Engineer.

13
14 B. Square Ceiling Diffusers – HP Assembly:

- 15 1. Diffusers to be steel unless otherwise indicated, louvered face furnished with frame type appropriate to installation.
- 16 2. Diffuser shall have throw characteristics of round diffuser having 360-degree horizontal blow pattern.
- 17 3. High performance type diffuser incorporating short throws and low NC levels. Louver cones shall be one-piece construction with no corner joints.
- 18 4. Unless otherwise indicated, diffuser shall have baked enamel finish with color selected by Architect.

19
20
21
22
23
24 2.02 SQUARE CEILING DIFFUSERS – LOUVERED FACE
25

26 A. Manufacturers:

- 27 1. Titus: Model TDC/TDC - AA.
- 28 2. Carnes: Series SK or SE.
- 29 3. Price Industries: Model AMD/SMD.
- 30 4. MetalAire Series 5000 or 5500S.
- 31 5. Krueger Series SH.
- 32 6. Equivalent as acceptable to Engineer.

33
34 B. Square Ceiling Diffusers Assembly:

- 35 1. Steel unless otherwise indicated, louvered face furnished with frame type appropriate to installation.
- 36 2. Directional blow pattern as shown on Drawings and as scheduled.
- 37 3. One-piece construction louver cones with no corner joints.
- 38 4. Unless otherwise indicated, baked enamel finish with color selected by Architect.

39
40
41 2.03 SQUARE CEILING DIFFUSERS - PLAQUE
42

43 A. Manufacturers:

- 44 1. Titus model OMNI
- 45 2. Carnes series SFPA/SHPA
- 46 3. Price model SPD
- 47 4. Metal Aire series 5750
- 48 5. Krueger series PLQ/5PLQ
- 49 6. Equivalent as acceptable to Engineer.

50
51 B. Steel unless otherwise indicated, furnished with frame type appropriate to installation.

52
53 C. 4-Way directional blow pattern unless shown on drawings otherwise.

54
55 D. One-piece removable square face plaque with one-piece backpan.
56

1 E. White, baked enamel finish or powder coat finish, unless otherwise indicated.

2
3 2.04 EGGCRATE GRILLES

4
5 A. Manufacturers:

- 6 1. Titus: Model 50.
7 2. Carnes: Model RAE or RAT.
8 3. Price Industries: Model C80.
9 4. MetalAire: Model CC.
10 5. Krueger: Model EGC.
11 6. Equivalent as acceptable to Engineer.

12
13 B. Eggcrate Grille Assembly:

- 14 1. Aluminum construction with frame type appropriate to installation.
15 2. Grille face 1 x 1-inch grid pattern 1-inch deep with a minimum of 85 percent free area.
16 3. Grille sizes and finishes as shown on Drawings and as scheduled. Unless noted otherwise, baked
17 enamel finish with color selected by Architect.
18 4. Screw holes on surface counter sunk to accept recessed type screws.
19 5. Provide with concealed fasteners.

20
21 PART 3 - EXECUTION

22
23 3.01 INSTALLATION

- 24
25 A. Install grilles, registers, and diffusers as shown on Drawings and according to manufacturer's instructions.
26
27 B. Furnish diffusers with equalizing grids where it is not possible to maintain minimum 2 duct diameter
28 straight duct into diffuser.
29
30 C. Equalizing grids shall consist of individually adjustable vanes designed for equalizing air flow into
31 diffuser neck and providing directional control of air flow.
32
33 D. Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.
34
35 E. Seal connections between ductwork drops and diffusers/grilles airtight. Use of duct tape or insulating
36 tape is not acceptable.
37
38 F. Where diffusers, registers, and grilles cannot be installed to avoid seeing inside duct, paint inside of duct
39 with flat black paint to reduce visibility.
40
41 G. Grilles and registers shall be securely and neatly attached to building construction or sheet metal flanges.
42
43 H. Adjust front and rear blades for draft free air pattern.
44
45 I. Adjust slot diffusers for draft free air pattern.
46

47
END OF SECTION 23 37 13

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SECTION 26 05 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 GENERAL PROVISIONS

- A. In general, the work includes: Electrical work and the kindred materials and operations as indicated on the drawings and as specified in the following articles of:

Section 26 05 00	General Electrical Requirements
Section 26 09 23	Occupancy Sensor Lighting Control System
Section 26 20 00	Basic Materials and Methods
Section 26 51 13	Lighting
Section 27 10 00	Telecommunications Distribution System
Section 28 31 00	Fire Alarm System

- B. Job Information: Obtain at building including:

1. Conditions affecting this Section of the Work.
2. Accessibility
3. Storage space.

1.03 GENERAL REQUIREMENTS

- A. This Section of the Specifications applies to all electrical work. The General Requirements, Supplementary Conditions, Instructions to Bidders and all Sections of the General Conditions of Contract form a part of these specifications and the Contractor shall consult them in detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical Contractor shall be included in the Work of this Section.

1.04 DEFINITIONS

- A. Certain terms used herein; on the drawings; and in the contract documents, shall be defined as follows:
- B. Provide: Furnish and install complete and ready for service.
- C. Exposed: Exposed to view in any room, hallway, passageway, or outside.
- D. Approval: The approval of the Architect in writing or by signed rubber stamp applied to drawings, illustrations, etc.

1.05 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

- 1 1.06 DRAWINGS
- 2 A. The Electrical drawings do not attempt to show the complete details of building construction which affect
3 the electrical installation. The Contractor shall refer to the architectural, civil, structural and mechanical
4 drawings for additional details which affect the proper installation of this work. The Contractor is
5 cautioned that diagrams showing electrical connections and/or circuiting are diagrammatic only and must
6 not be used for obtaining lineal runs of wire to conduit. Wiring diagrams do not necessarily show the
7 exact physical arrangement of the equipment.
- 8 1.07 MATERIAL AND EQUIPMENT
- 9 A. All material and equipment shall be new and of the quality used for the purpose in good commercial
10 practice and shall be standard product of reputable manufacturers. Each major component of equipment
11 shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate, securely
12 affixed on the equipment in a conspicuous place.
- 13 1.08 SUBSTITUTION AND APPROVAL OF MATERIAL
- 14 A. See Instructions to Bidders and General Requirements.
- 15 B. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings and
16 descriptions of material proposed for substitution and shall fully describe all points in which it differs
17 from the articles specified. Two copies will be retained by the Architect and one copy returned to the
18 Contractor with approval or revisions indicated thereon.
- 19 1.09 DAMAGE TO OTHER WORK
- 20 A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own or any
21 other trade resulting from the execution of his work. It shall be the Contractor's responsibility to
22 adequately protect his work at all times. All damages resulting from his operations shall be repaired or
23 the damaged portions replaced by the party originally performing the work, (to the entire satisfaction of
24 the Architect), and all cost thereof shall be borne by the Contractor responsible for the damage.
- 25 1.10 COOPERATION WITH OTHER TRADES
- 26 A. This Contractor shall completely cooperate with all other trades in the matter of planning and executing
27 of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space
28 requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct
29 the work of any trade.
- 30 1.11 NEGLIGENCE
- 31 A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing
32 delay or expense to another party, he shall pay the actual amount of the damages to the party who
33 sustained the loss.
- 34 1.12 FIELD CHANGES
- 35 A. Should any change in drawings or specifications be required to comply with local regulations and/or field
36 conditions, the Contractor shall refer same to Architect for approval before any work which deviates
37 from the original requirements of the drawings and specifications is started. In the event of
38 disagreements as to the necessity of such changes, the decision of the Architect shall be final.
39

1 1.13 CUTTING AND PATCHING IN NEW CONSTRUCTION

2 A. As necessary and with approval to permit the installation of conduit or any part of the work under this
3 branch. Any cost caused by defective or ill-timed work shall be by the party responsible therefor.
4 Patching of holes, openings, etc. resulting from the work of this branch shall be furnished by this
5 contractor.

6 B. See Division 1 for additional requirements.

7 C. See also "Demolition, Renovation, and Disposition of Existing Equipment" in this Section.

8 1.14 COMPLETION DATES

9 A. This Contractor shall be in a position to meet all completion dates established by the Architect and shall
10 furnish all labor of all classes required to meet such schedules and completion dates.

11 1.15 STANDARDS, CODES AND PERMITS

12 A. All work shall be installed in accordance with National, State and Local electrical codes, laws,
13 ordinances and regulations. Comply with all applicable OSHA regulations.

14 B. All materials shall have a U.L. label where a U.L. standards and/or test exists.

15 C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working
16 drawings required by them.

17 D. Secure and pay for all permits and licenses required.

18 1.16 CLEAN-UP

19 A. This Contractor shall at all times keep the premises free from excessive accumulation of waste material
20 or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he shall leave
21 his work broom clean or its equivalent.

22 B. In case of dispute, Architect may order the removal of such rubbish and charge the cost to the responsible
23 contractor as determined by the Architect. At the time of final clean-up all fixtures and equipment shall
24 be thoroughly cleaned and left in proper condition for their intended use.

25 1.17 TESTS

26 A. The Contractor shall provide all instrumentation, labor and conduct all tests required by the Architect.
27 All tests shall be made before any circuit or item of equipment is permanently energized. Circuits shall
28 be phased out and loads shall be distributed as evenly as possible on all phases. All phase conductors
29 shall be entirely free from grounds and short circuits. All instrumentation and personnel required for
30 testing shall be provided by the Contractor and all tests shall be conducted in the presence of the
31 Architect or his authorized representative.

32 B. System Tests:

33 1. The following tests are required prior to energization of the electrical system:

34 a. Secondary feeders shall have an insulation resistance test utilizing a megger applying a
35 test potential of 500 volts DC minimum.

36 b. Establish secondary phase to ground voltages.

37 c. Establish proper phase relationship and motor rotation.

- 1 2. The following tests are required under normal load condition:
- 2 a. Record secondary phase to phase and phase to ground voltages and phase currents at all
- 3 major equipment, apparatus, and on all secondary feeders. Voltage readings shall be
- 4 taken at line side terminals of distribution centers and panelboards.
- 5 b. Confirm proper phase relationship and motor rotation.
- 6 c. Confirm load balance at distribution centers and panels. Rebalance load if necessary
- 7 such that the minimum unbalance between phases shall not exceed 7-1/2%.
- 8 d. Confirm operation of all electrically operated apparatus, such as circuit breakers,
- 9 transfer switches, etc., by exercising same under load.
- 10 e. Record all settings and calibrations of circuit breakers, transfer switches, transformers,
- 11 meters, timing devices, etc.

12 C. Records:

- 13 1. All test data obtained by the E.C. or manufacturer/supplier shall be recorded and filed with the
- 14 maintenance manual as part of permanent job records. Test data shall include identification of
- 15 instruments employed (field test only), condition of test (time, date, weather, etc.), parameters of
- 16 test, personnel conducting test, and any pertinent information or conditions noted during the test.

17 1.18 SHOP DRAWINGS

- 18 A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment brochure
- 19 depicting:

- 20 1. Lighting Fixtures
- 21 2. Breakers
- 22 3. Occupancy Sensors
- 23 4. Fire Alarm System Devices
- 24 5. Telecommunications Equipment and Cabling
- 25 6. Wiring Devices
- 26 7. Lighting Controls
- 27 8. Other materials at the request of the Engineer

- 28 B. Shop drawings shall bear the Contractor's stamp indicating approval.

- 29 C. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

30 1.19 WORKMANSHIP

- 31 A. The installation of all work shall be made so that its several component parts will function as a workable
- 32 system complete with all accessories necessary for its operation, and shall be left with all equipment
- 33 properly adjusted and in working order. The work shall be executed in conformity with the best accepted
- 34 standard practice of the trade so as to contribute to efficiency and appearance. It shall also be executed
- 35 so that the installation will conform and adjust itself to the building structure, its equipment and its usage.

36 1.20 DRAWINGS OF OTHER TRADES

- 37 A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the
- 38 parties performing the work of the other trades; their shop drawings, and he shall be governed
- 39 accordingly in laying out his work.

- 40 B. Specifically examine shop drawings to confirm voltage, current characteristics, and other wiring
- 41 requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.

- 1 1.21 FIELD MEASUREMENTS
- 2 A. The Contractor shall take all field measurements necessary for his work and shall assume the full
3 responsibility for their accuracy.
- 4 1.22 STRUCTURAL INTERFERENCES
- 5 A. Should any structural interferences prevent the installation of the outlets, running of conduits, etc., at
6 points shown on drawings, the necessary minor deviation therefrom, as determined by the Architect, may
7 be permitted. Minor changes in the position of the outlets or equipment if decided upon before any work
8 has been done by the Contractor shall be made without additional charge.
- 9 1.23 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE
- 10 A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of the
11 building and site which may affect the execution of his work. No extra payment will be allowed for the
12 failure to obtain this information. If in the opinion of the Contractor there are omissions or errors in the
13 plans or specifications, the Contractor shall clarify these points with the Architect before submitting his
14 bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the greater quantity or
15 better quality.
- 16 1.24 GUARANTEE
- 17 A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding lamps,
18 for a period of one year from the date of his final payment. He shall remedy any defects in workmanship
19 and repair or replace any faulty equipment which shall appear within the guarantee period to the entire
20 satisfaction of the Architect at no additional charge.
- 21 1.25 TEMPORARY WIRING AND SERVICE
- 22 A. No temporary electrical service is required on this project. The existing electrical distribution system in
23 the Dane County City-County Building shall provide any power required for construction.
- 24 B. All contractors shall provide and maintain their own extension cords and additional lamps as required to
25 perform his work properly. Contractors requiring temporary connections to 3 phase power service and
26 single phase feeders for other than lighting and small fractional horsepower motorized tools shall make
27 arrangement with the Electrical Contractor. Contractors requiring lighting outside of the building shall
28 make their own arrangements with the Electrical Contractor and pay all costs for installation,
29 maintenance and removal. Contractors requiring electrical equipment over one HP, including welders,
30 hoists, heaters and coolers shall make their own arrangements for such service beyond the main switch
31 and shall pay all costs thereof.
- 32 C. No permanent electrical equipment or wiring shall be used for temporary connections, unless authorized
33 by this Section, upon signed order and with approval by the Architect in behalf of the Owner. Such
34 approvals shall not shorten guarantee period.
- 35 D. Electrical energy to be paid for by owner.
- 36 1.26 ELECTRICAL SERVICE
- 37 A. The existing electrical service in the Dane County City-County Building shall remain as is.
- 38 1. The building has a 208Y/120-volt, 3-phase, 4-wire service for general lighting and receptacle
39 loads.
- 40 2. The building also has a 480-volt electrical service that is used for large HVAC loads.

1 3. Refer to the electrical drawings for partial one line riser diagrams and the work involved on the
2 project.

3 1.27 BRANCH CIRCUIT WIRING

4 A. See plans for general arrangement of circuits, conduit runs, and ratings of branch circuits and special
5 circuits.

6 B. Provide everything necessary to comply with the general scheme shown, including all types of control.

7 C. Circuit numbers as shown on plans are for contractor to plan his wiring and for estimating purposes.
8 These numbers are not necessarily consecutive numbers of the panelboard breakers. Balanced load on
9 bus is to be the determining factor in arrangement of circuits. Balance loading to within 7 1/2%.

10 D. Minimum size of lighting system branch circuit conductors to be #12 AWG.

11 E. Conductors terminating at wired outlets shall extend at least eight (8) inches beyond outlet box conduit
12 fitting.

13 F. 120 volt circuit home runs greater than 50 feet in length shall have #10 AWG minimum size between
14 panel and first receptacle or fixture outlet.

15 **G. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All
16 branch circuits shall be furnished and installed with an individual accompanying neutral, sized the
17 same as the phase conductors.**

18 1.28 MOTOR WIRING

19 A. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall be
20 furnished by others.

21 B. Motors shall be set in place by others and the associated motor starters and controllers shall be turned
22 over to this Contractor for erection and line voltage power wiring.

23 C. Any contractor supplying starters and controllers that are not part of this contract shall index same and
24 provide this Contractor with instructions as to proper location in sufficient time to permit the installation
25 of a concealed raceway system.

26 D. Where this Contractor is required to provide control wiring, the Contractor supplying the controllers shall
27 provide all necessary and required wiring diagrams for proper installation.

28 E. Low voltage (less than 115 volts) control wiring shall be by others, unless noted elsewhere in the
29 specifications except that this Contractor shall extend circuit to associated transformers, wire and connect
30 to same.

31 F. This Contractor shall examine the plans and specifications of other sections and shall include in his bid
32 all control wiring, as referenced to be performed by Division 26.

33 G. Required disconnect switches furnished by other sections shall be installed by Division 26. Furthermore,
34 this Contractor shall provide all disconnect switches required by code that are not furnished by other
35 sections.

36 1.29 SPECIAL OUTLETS

37 A. General: Furnish and install outlets, wiring and receptacles accordingly, at locations required by
38 equipment serviced or otherwise as directed. Extend wiring to outlets on equipment and make final

1 connection.

2 1.30 IDENTIFICATION

3 A. General:

- 4 1. Materials and equipment installed under this Section shall be clearly identified as listed below.
- 5 2. Locate identification conspicuously.
- 6 3. Terminology to be approved by Architect.
- 7 4. See plans for any additional items to be identified.
- 8 5. Loads such as motors shall be described by function rather than by the system of arbitrary number
- 9 as shown on electrical plans.
- 10 6. Use abbreviations sparingly.

11 B. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely screwed or riveted to the

12 following equipment. Size 1" x 4" with 3/8" high letters; unless space available dictates differently.

- 13 1. Each panelboard, contactor, time switch, starter or disconnect switch. Locate on inside cover of
- 14 panels.
- 15 2. Each feeder at all accessible locations.
- 16 3. Each end of empty conduit runs to indicate the intended use of the conduit and the location of
- 17 opposite end. Use room numbers that are permanently assigned.

18 C. Typewritten Directory: Each panelboard both new and existing shall be provided with a typewritten

19 directory attached to the inside of panel door and covered with clear plastic indicating load served and

20 rooms served by each protective device in the respective panel. Spares and spaces shall be clearly

21 identified.

22 D. Switch Station:

- 23 1. All key switches shall be engraved indicating controlled item.
- 24 2. All remote switches shall be engraved indicating controlled item.

25 E. Conductor Identification:

- 26 1. Identify each conductor at each wiring device, connector or splice point with permanently attached
- 27 wrap-around adhesive markers as manufactured by Brady Co. or 3M.
- 28 2. This identification shall include branch circuit number, control circuit, or any other appropriate
- 29 number or lettering that will expedite future tracing and trouble shooting.

30 1.31 LOCATIONS OF OUTLETS AND WIRING DEVICES

31 A. Outlets:

- 32 1. Locations of outlets and electrical equipment on the drawings are approximate only. Unless
- 33 otherwise indicated on the drawings or established in the specifications, the exact locations of
- 34 electrical outlets shall be established in the field by directive from the Architect. Generally,
- 35 outlets shall be located as required for proper installation of equipment served and otherwise
- 36 locations shall be established by construction or code requirements and such as to be coordinated
- 37 with equipment of other trades.
- 38 2. This Section shall consult with the Architect and refer to all details, sections, elevations and
- 39 equipment plans and the plans of other trades for exact location.
- 40 3. The Architect reserves the right to make reasonable changes in the location of outlets, apparatus or
- 41 equipment up to the time of roughing in. Such changes as directed shall be made by the
- 42 Contractor without additional compensation.
- 43 4. Dimensions taken by scale shall not be used to establish rough-in locations.

- 1 B. Wiring Devices:
- 2 1. The approximate location of wiring devices are indicated on the drawings; the specific location
- 3 shall be determined in accordance with "Location of Outlets" of these specifications and as
- 4 follows.
- 5 2. This Section is referred to equipment plans, equipment shop drawings, elevation drawings and
- 6 other detail or dimensional drawings, and he shall consult with the Architect before installation of
- 7 proceeding with any work dependent upon this information.
- 8 3. Generally, wiring devices shall be located as follows:
- 9 a. Wall receptacles shall generally be centered 15" above the finished floor and 6" above
- 10 surface of built-in counters and tables where same abuts wall and 4" above
- 11 backsplashes if counters are so equipped.
- 12 b. Special purpose receptacles shall be located as required by equipment served.
- 13 c. Switches shall be centered 48" above finished floor on latch side of door opening with
- 14 edge of plate not more than 12" from door frame, except as noted on the drawings.
- 15 d. In hazardous areas, the location of wiring devices shall be established by Code
- 16 requirements which shall take precedence over conflicting information on the drawings
- 17 or included herein.

18 1.32 TELEPHONE SYSTEM

- 19 A. Refer to the electrical specification section 27 10 00 – Telecommunication Distribution System for
- 20 detailed information on the telephone system.
- 21 B. Dane County is currently using a VOIP (voice over internet protocol) telephone system so all telephone
- 22 cabling will be using same cabling used for data.
- 23 C. Telephone instruments, switching equipment, and other accessories shall be furnished and installed by
- 24 the Owner (Dane County).
- 25 D. This Contractor shall supply all required cabling, jacks, conduit, sleeves, and service fittings for the
- 26 telephone system.
- 27 E. All conduits shall be complete with fish wire by this Contractor, and all telephone outlets shall be fed by
- 28 a minimum 1" conduit.
- 29 F. All telephone boxes shall be two gang boxes with one gang plaster cover.
- 30 G. Verify all phone locations with the Architect in the field.

31 1.33 DEMOLITION, RENOVATION AND DISPOSITION OF EXISTING EQUIPMENT

- 32 A. This Contractor shall note that portions of the existing building will remain in service during portions of
- 33 the construction period. Areas of the building will be vacated as required to facilitate construction. This
- 34 Contractor shall proceed with the completion of his work in such a manner as to cause the least possible
- 35 interference with the Owner's operation. All work required in the existing building shall be done in a
- 36 manner and time acceptable to the Owner.
- 37 B. Outages and other work rendering existing equipment inoperative shall be held to a minimum - prior
- 38 arrangements for each shall be made with the Owner and shall be acceptable as to time and duration.
- 39 C. Electrical equipment in conflict with construction shall be removed and/or relocated as indicated on the
- 40 drawings, as directed or required. This Contractor shall remove all electrical equipment released from
- 41 service as a result of construction, and no equipment removed shall be reused, except as specifically
- 42 directed on the drawings or elsewhere herein. All electrical equipment removed during construction shall

1 be presented to the Owner for his acceptance or rejection. Materials rejected by the Owner become the
2 Contractor's property and shall be removed from the site.

3 D. This Contractor shall be responsible for the work of other trades as may be necessary to facilitate the
4 installation of electrical work in the existing building. Such work necessary that is normally done by
5 other trades and is not covered as a part of other divisions of the work shall be done under the direction
6 and at the expense of the Electrical Contractor. This work shall include but is not limited to cutting,
7 patching, and all work necessary and required to leave existing building in condition acceptable to the
8 Architect.

9 E. Any existing circuits or equipment not shown on the drawings and which are logically expected to be
10 continued in service and which may be interrupted or disturbed during construction shall be reconnected
11 in an approved manner. In addition, any existing circuit or equipment which may require relocation s or
12 rerouting, as a result of construction, shall be considered a part of the work of this branch and shall be
13 done by this contractor with no additional compensation.

14 F. All coring that is required for electrical work shall be by this Contractor.

15 G. All new conduit and wiring shall be concealed where possible to do so without extensive cutting and
16 patching. All exposed work shall be run in wiremold and installed only where approved by Architect.
17 Routing shall be subject to Architects approval. Make use of all standard wiremold colors to match
18 surfaces as closely as possible.

19 H. All ballasts and lamps removed during the project, unless part of fixtures claimed by the Owner, become
20 the Contractor's property and he shall dispose of them in accordance with applicable DNR and EPA
21 regulations.

22 1.34 SEALING AND FIREPROOFING

23 A. Sealing and fireproofing of openings between conduit, cable tray, wireway, trough, cablebus, busduct,
24 etc. and fire rated surfaces shall be the responsibility of the contractor whose work penetrates the
25 opening.

26 B. Sealing and fireproofing shall use materials and methods complying with ASTM E814 requirements
27 appropriate to the rating of the material penetrated.

28 C. Materials by Dow-Corning, 3M, Specified Technologies, Inc., and Chase-Foam are acceptable if in
29 accordance with (B) above.

30 D. Submit manufacturer's penetration details to authority having jurisdiction. Details shall confirm
31 method's compliance with ASTM E814.

32 E. Include copies of penetration details in Project Operation and Maintenance Manuals.

33 END OF SECTION 26 05 00

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SECTION 26 09 23

OCCUPANCY SENSOR LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 GENERAL PROVISIONS

- A. In general, the work includes:
 - 1. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
 - 2. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.
 - 3. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.

1.03 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years.
- B. All components shall be UL listed, offer a five (5) year warranty and meet all state and local applicable codes requirements.

1.04 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the owner, all or in parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.05 SUBMITTALS

- A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data, and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

- 1 B. Submit a lighting plan clearly marked by manufacturer showing proper product, location, and orientation
2 of each sensor.
- 3 C. Submit any interconnection diagrams per major sub-system showing proper wiring.
- 4 D. Submit standard catalog literature which includes performance specifications indicating compliance to
5 the specification.
- 6 1.06 SYSTEM OPERATION
- 7 A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction
8 with the occupancy system.

9 PART 2 - PRODUCTS

10 2.01 ACCEPTABLE MANUFACTURERS

- 11 A. The Watt Stopper, Inc.
- 12 B. Or Equivalent Devices by the Following Manufacturers
- 13 1. Hubbell
- 14 2. Leviton
- 15 3. Sensor Switch

16 2.02 SYSTEM OPERATION

- 17 A. All products shall be Watt Stopper product numbers:
- 18 1. Ceiling Sensors: W-500A, W-1000A, W-2000A, W-2000H, W-PIR, DT-100L, CI-100, CI-200.
- 19 2. Wall Sensors: WI-120A, WI-277A, WS-120, WS-277, WM-120, WM-277.
- 20 3. Power and Slave Packs: A-120E, A-277E, S-120/277.
- 21 4. Low Temperature: CB-100, CB-200.
- 22 B. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet, and
23 gross motion up to 1,000 square feet.
- 24 C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277
25 volts, and shall have 180 degree coverage capability.
- 26 D. Bi-level wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts
27 to 277 volts.
- 28 E. Passive Infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier
29 configuration, with grooves-in to eliminate dust and residue build-up.
- 30 F. Passive Infrared and Dual Technology sensors shall have fully automatic operation, offer daylighting
31 footcandle adjustment control and be able to accommodate dual level lighting.
- 32 G. All sensors shall be capable of operating normally with electronic ballast, PL lamp systems, and rated
33 motor loads.
- 34

- 1 H. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction
2 shall occur in coverage due to the cycling of air conditioner or heating fans.
- 3 I. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls
4 shall be recessed to limit tampering.
- 5 J. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is
6 utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is
7 replaced. This control shall be recessed to prevent tampering.
- 8 K. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance to
9 assure reliable performance and eliminate sensor cross talk. Sensors using multiple frequencies are not
10 acceptable.
- 11 L. All sensors shall provide a method of indication to verify that motion is being detected during testing and
12 that the unit is working.
- 13 M. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally
14 Closed, and Common outputs for use with HVAC control, Data Logging, and other control options.
15 Sensors utilizing separate components to achieve this function are not acceptable.
- 16 N. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes and
17 shall have voltage drop protection.
- 18 O. All sensors shall have UL rated, 94V-0 plastic enclosures.
- 19 2.03 CIRCUIT CONTROL HARDWARE - CU
- 20 A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to
21 mount on external J boxes and be integrated self-contained unit consisting internally of load switching
22 control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors.
- 23 B. Relay Contacts shall have ratings of:
- 24 1. 13A - 120 VAC Tungsten
25 2. 20A - 120 VAC Ballast
26 3. 20A - 277 VAC Ballast
- 27 2.04 CONTROL WIRING
- 28 A. Control wiring between sensors and controls units shall be Class II, 18-24 AWG stranded U.L.
29 Classified, PVC insulated or Teflon jacketed cable approved for use in plenums, where applicable.
30

1 PART 3 - EXECUTION

2 3.01 INSTALLATION

3 A. It shall be the contractor's responsibility with the suppliers assistance to locate and aim sensory in the
4 correct location required for complete and proper volumetric coverage within the range of coverage(s) of
5 controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely
6 cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any
7 location within in the room(s). The locations and quantities of sensors shown on the drawings are
8 diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall
9 provide additional sensors if required to properly and completely cover the respective room.

10 B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory
11 authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.

12 C. Proper judgement must be exercised in executing the installation in the available space and to overcome
13 local difficulties due to space limitations or interference of structural components. The contractor shall
14 also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the
15 operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

16 END OF SECTION 26 09 23

SECTION 26 20 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

- A. General Conditions of the Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 REFERENCES

- A. National Electrical Manufacturer's Association (NEMA).
- B. Underwriters Laboratories, Inc. (UL).
- C. American Society for Testing and Materials (ASTM).
- D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

A. Product Data

- 1. Submit for disconnects, motor starters, panelboards, circuit breakers, overcurrent protective devices, transformers, and mini-power centers.
- 2. Product data sheets with printed installation instructions.

B. Shop Drawings:

- 1. Submit for motor starters.
- 2. Show enclosure dimensions, nameplate nomenclature, electrical ratings, and thermal unit schedule.
- 3. Wiring diagrams and schematics.

C. Approval of equipment supplied in this section is contingent upon Contractor verification of available fault current from electric utility.

- 1. Notify ENGINEER if available fault current is higher than specified equipment.

D. Submit in accordance with Division 1.

E. Operation and Maintenance (O&M) Data:

- 1. Maintenance data for materials and products for inclusion in Operating and Maintenance specified in Division 1.
- 2. Submit in accordance with Division 1.

F. Test Results:

- 1. Report of field tests and observations certified by Contractor.

1 1.04 QUALITY ASSURANCE

2 A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized
3 Testing Laboratory (NRTL).

4 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

5 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

6 B. Regulatory Requirements:

7 1. National Electrical Code: Components and installation shall comply with NFPA 70.

8 2. Local codes and ordinances.

9 PART 2 - PRODUCTS

10 2.01 ELECTRICAL METALLIC TUBING (EMT)
11 INTERMEDIATE METALLIC CONDUIT (IMC)
12 GALVANIZED RIGID STEEL CONDUITS (GRS)

13 A. Manufacturers:

14 1. Allied Steel

15 2. Omega

16 3. Wheatland

17 4. Columbia

18 B. Manufacturer's standard lengths and size.

19 C. Protected inside and out by hot-dipped galvanized or electrogalvanized coating.

20 D. Minimum size: 3/4 inch, except as follows:

21 1. Conduit for lighting switch legs containing switched conductors only may be 1/2 inch.

22 2. As noted on drawings.

23 E. Do not use aluminum conduit.

24 2.02 PLASTIC CONDUIT (PVC)

25 A. Manufacturers:

26 1. Carlon.

27 2. Genova.

28 3. Certainteed.

29 B. Standard lengths and sizes.

30 C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC2 standards, UL
31 listed, and as required by NEC.

32 D. Rated for 90 degree C. cable.

33 E. Minimum size: 2" inches.

34

- 1 2.03 FLEXIBLE CONDUIT
- 2 A. Manufacturers:
- 3 1. Triangle PWC, Inc.
- 4 2. Anaconda
- 5 3. Flexsteel
- 6 4. American Flexible Conduit
- 7 B. Galvanized flexible steel.
- 8 C. Standard conduit sizes.
- 9 D. Minimum Size: 1/2 inch.
- 10 2.04 LIQUIDTIGHT FLEXIBLE CONDUIT
- 11 A. Manufacturers:
- 12 1. O-Z/Gedney Company
- 13 2. American Flexible Conduit
- 14 3. Flex-Guard, Inc.
- 15 4. Licutite
- 16 5. Anaconda
- 17 B. Galvanized flexible steel.
- 18 C. Standard conduit sizes.
- 19 D. Minimum Size: 1/2 inch.
- 20 E. Heavy wall PVC jacket.
- 21 2.05 FITTINGS
- 22 A. Manufacturers:
- 23 1. Appleton Electric Company.
- 24 2. Steel City, American Electric.
- 25 3. Oz-Gedney Co.
- 26 B. Steel or malleable iron, zinc galvanized or cadmium plated.
- 27 C. Do not use set screw or indentor type fittings.
- 28 D. Do not use aluminum or die cast fitting.
- 29 E. EMT IMC and GRS Connectors and Couplings:
- 30 1. Threaded.
- 31 2. Gland compression type.
- 32 3. Insulated throat.
- 33 4. Rain and concrete type.

- 1 F. Flexible Conduit Connectors and Couplings:
- 2 1. Threaded.
- 3 2. Insulated throat.
- 4 3. Grounding type.
- 5 4. Gland compression type.
- 6 G. Liquidtight Flexible Conduit Fittings:
- 7 1. Liquidtight.
- 8 2. Insulated throat.
- 9 3. Threaded.
- 10 4. Gland compression type.
- 11 5. Grounding type.
- 12 H. Expansion Joints:
- 13 1. Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
- 14 2. Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.
- 15 I. Seals:
- 16 1. Wall entrance, Appleton Type FSK or FSC.
- 17 J. Drain Fittings:
- 18 1. Automatic Drain Breather:
- 19 a. Explosionproof.
- 20 i. Safe for Class I, Groups C and D.
- 21 b. Capable of passing minimum 25 cc water/minimum and minimum 0.05 cubic foot
- 22 air/minimum at atmospheric pressure.
- 23 2. Condensate Drain:
- 24 a. Conduit outlet body, Type T.
- 25 b. Threaded, galvanized plug with 3/16 inch drilled holed through plug.
- 26 2.06 SURFACE METAL RACEWAY
- 27 A. Manufacturers:
- 28 1. Wiremold Co.
- 29 2. Hubbell Co.
- 30 3. Steel City, American Electric
- 31 B. General:
- 32 1. Wiremold Series 700 series or equal.
- 33 2. Base and cover section to accommodate pulling conductors through raceway.
- 34 3. capable of being over painted.
- 35 4. Full complement of fitting must be available.
- 36 C. The use of surface raceways shall be minimized on the project. Surface raceway shall only be used
- 37 where installing new devices on existing walls that are not being furred out or where conduit cannot be
- 38 installed in an existing wall
- 39 D. Any use of surface raceway shall be approved by the Architect prior to installation.

- 1 2.07 WIRES, CABLES, AND CONNECTORS
- 2 A. Manufacturers:
- 3 1. Wire and Cable:
- 4 a. Continental
- 5 b. Southwire.
- 6 c. Rome Cable.
- 7 d. Houston Wire and Cable.
- 8 e. Beldon.
- 9 f. Dekoron.
- 10 g. Royal
- 11 h. South
- 12 i. General
- 13 2. Connectors:
- 14 a. Burndy.
- 15 b. Thomas and Betts.
- 16 c. Blackburn, American Electric.
- 17 3. Electrical Tape:
- 18 a. 3M Scotch Brand.
- 19 b. Plymouth.
- 20 c. or equal.
- 21 B. Copper wire only.
- 22 C. 600 V insulation (ASTM standard compounds) and color code conductors for low voltage (secondary
- 23 feeders and branch circuits) as required by NEC.
- 24 1. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for branch circuit and feeder
- 25 conductors size No. 8 AWG and smaller.
- 26 2. Type XHHW-2 Stranded: Single conductor for branch circuits, feeders and service conductors
- 27 larger than No. 8 AWG.
- 28 3. Provide grounding conductor with same insulation as circuit conductors when run with circuit
- 29 conductors.
- 30 4. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for 120 v control wiring and
- 31 No. 14 AWG minimum for graphic indication, nonshielded instrumentation and other control
- 32 wiring operating at less than 120 v unless otherwise noted on Drawings.
- 33 a. Provide high density polyethylene jacketed multi-wire cable assemblies in underground
- 34 conduit or duct.
- 35 D. Joints, Taps, and Splices:
- 36 1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed compression spring-
- 37 type solderless connectors with plastic cover.
- 38 2. Joints, Taps, and Splices in Conductors No. 8 AWG and Larger: Solderless two or four-bolt
- 39 compression type connectors of type that will not loosen under vibration or normal strains.
- 40 3. Terminations: Compression-type crimp lugs.
- 41 2.08 BOXES
- 42 A. Manufacturer:

- 1 1. Interior Outlet Boxes:
 - 2 a. Appleton Electric Company.
 - 3 b. Raco.
 - 4 c. Steel City, American Electric.
- 5 2. Weatherproof Outlet Boxes:
 - 6 a. Appleton Electric Company.
 - 7 b. Crouse-Hinds Company.
 - 8 c. O-Z/Gedney company.
 - 9 d. Perfect-Line, American Electric.
- 10 3. Junction and Pull Boxes:
 - 11 a. Hoffman Engineering Company.
 - 12 b. Keystone Columbia, Inc.
 - 13 c. Electromate.
- 14 B. Outlet Boxes - Flush Mounted:
 - 15 1. Wall Outlets: Square corner, galvanized masonry type with internally mounted ears or 4 -inches
 - 16 square with raised cover having square corners and internally mounted ears.
 - 17 2. Ceiling Lighting Fixture Outlet Boxes: 4-inch square galvanized box with raised cover set flush
 - 18 with finished surface, complete with 3/8 inch fixture stud.
- 19 C. Outlet Boxes - Surface Mounted:
 - 20 1. General Use: 4-inches square with raised device cover.
 - 21 2. Weatherproof: Cast galvanized with threaded hub.
 - 22 3. Safety outlet enclosure - Tay Mac Co. - Verify outlet configuration.
 - 23 4. Hazardous Locations: Cast galvanized approved for classification of area.
- 24 D. Junction and Pull Boxes:
 - 25 1. Fabricate from code gauge galvanized steel, with covers held in-place by corrosion resistant
 - 26 machine screws.
 - 27 2. Size as required by code for number of conduits and conductors entering and leaving box.
 - 28 3. Provide with welded seams where applicable, and equipment with corrosion resistant nuts, bolts,
 - 29 screws, and washers.
 - 30 4. Finish with rust inhibiting primer.
- 31 2.09 FIRE RATED THROUGH FLOOR FITTINGS
 - 32 A. Manufacturers:
 - 33 1. Hubbell Electric Co.
 - 34 2. Square D.
 - 35 3. Steel City, American Electric.
 - 36 B. Rating:
 - 37 1. Floor fittings requiring penetration of floor slab listed by UL and have UL fire rating of 2 hours.
 - 38 C. Floor Service Pedestal:
 - 39 1. Painted textured aluminum surface.
 - 40 2. 2 to 8 gangs of service capacity and suitable for:
 - 41 a. Duplex receptacles 15 or 20-amp.

- 1 b. Single twist lock receptacle 20-or 30-amp.
- 2 c. Communication/data outlet (2/gang).
- 3 d. 1-inch ID protective bushing for cables.
- 4 e. Furniture feed plate suitable for 3/4-inch flexible metal conduit connection.

5 D. Junction Boxes in Ceiling Space Below Floor:

- 6 1. Suitable to accommodate separate services of power and communications.
- 7 2. Code approved for plenum space when applicable.

8 E. Raceways through Floor:

- 9 1. Provide separation of power and low voltage.
- 10 2. For 2-inch core holes:
 - 11 a. 3/4 inch raceway for communication.
 - 12 b. 1/2 inch raceway for power.
 - 13 c. Heat Transfer: .11 square inch of copper cross section maximum for both.
- 14 3. For 3-inch core holes:
 - 15 a. 1-1/4 inch raceway for communication.
 - 16 b. 1/2 inch raceway for power.
 - 17 c. Heat Transfer: .16 square inch of copper cross section maximum for both.

18 F. Abandonment Plates:

- 19 1. Maintain same UL listed fire rating.
- 20 2. Packaged, identified, and turned over to OWNER.

21 2.10 WIRING DEVICES

22 A. Manufacturers:

- 23 1. Hubbell Wiring Device Division.
- 24 2. Pass and Seymour, Inc.
- 25 3. Leviton
- 26 4. Cooper Wiring Devices

27 B. Fabricated Devices:

- 28 1. Factory-fabricated, specification grade wiring devices in type, color, and electrical rating for service indicated. Ivory color or as selected by ENGINEER or OWNER.
- 29 2. Wiring devices of one manufacturer.
- 30 3. See Drawing symbol schedule for identification of device type.

31 C. Switches:

- 32 1. General Use Lighting Switches: 20 amp toggle, equal to Hubbell No. 1221-I series.
- 33 2. Switches controlling equipment, operation of which is not evident from switch position, shall include flush neon pilot light in conjunction with proper switch. Each switch shall be complete with engraved plate to identify equipment being controlled (white letters on black, 1/8 inch high minimum).

34 D. Receptacles:

- 35 1. General use duplex receptacles: NEMA No. 5-20R, grounding type, 20 amp Hubbell No. 5362 Specification Grade.

- 1 2. Special purpose receptacles as shown on Drawings and schedules.
- 2 3. Receptacles supplied from standby emergency system to have red face.
- 3 4. GFI receptacles shall be Hubbell GFR5352IA
- 4 E. Wiring Device Plates and Covers:
- 5 1. Wall plates for wiring devices with ganging and cut-outs as indicated, provided with metal screws
- 6 for securing plates to devices, screw heads colored to match finish of plate.
- 7 2. Plates for Flush Mounted Devices: Equal to Sierra P line specifications grade Type No. 430
- 8 brushed stainless steel.
- 9 3. Telephone outlet configuration to match telephone outlet jack or cable.
- 10 4. Device plates for surface mounted Type FS or FD boxes to be Type FSK galvanized steel.
- 11 5. Device plates for surface mounted, 4-inch square bossed to be ½ inch raised galvanized steel
- 12 covers.
- 13 6. Weatherproof outlet enclosure for exterior devices or devices in damp locations to be marked
- 14 galvanized gray cast malleable with gasketed lift cover plate as shown on Drawings. Suitable for
- 15 wet locations while in use. Enclosure must be gasketed. Provide Intermatic WP1010MC,
- 16 WP1010HMC, or WP1030MC with appropriate mounting base(s) and inserts.

17 2.11 MOTOR AND CIRCUIT DISCONNECTS

18 A. Manufacturers:

- 19 1. Eaton/Cutler-Hammer
- 20 2. Siemens
- 21 3. Square D
- 22 4. Allen Bradley
- 23 5. General Electric

24 B. Enclosed Circuit Breaker Construction:

- 25 1. Dual cover interlock.
- 26 2. External trip indication.
- 27 3. Provisions for control circuit interlock.
- 28 4. Padlock provisions for padlock in Off position.
- 29 5. Handle attached to box, not cover.
- 30 6. Handle position indicates On, Off or Tripped.
- 31 7. Provisions for insulated or groundable neutral.

32 C. Safety Switches:

- 33 1. NEMA heavy duty Type HD.
- 34 2. Dual cover interlock.
- 35 3. Visible blades.
- 36 4. Provisions for control circuit interlock.
- 37 5. Pin type hinges.
- 38 6. Tin plated current carrying parts.
- 39 7. Quick make and break operator mechanism.
- 40 8. Handle attached to box, not cover.
- 41 9. Handle position indication, On in up position and Off in down position.
- 42 10. Padlock provisions for up to 3 padlocks in Off position.

- 1 11. UL listed lugs for type and size of wire specified.
- 2 12. Spring reinforced fuse clips for Class R fuses.
- 3 13. Provisions for insulated or groundable neutral.
- 4 14. UL listed short circuit rating 200,000 RMS amp with Class R fuses.
- 5 D. Enclosures:
- 6 1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
- 7 2. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish.
- 8 2.12 FUSES
- 9 A. Manufacturers:
- 10 1. Bussmann
- 11 2. Gould Shawmut
- 12 3. Littlefuse
- 13 4. Brush
- 14 B. 250 V. Fuses:
- 15 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 16 interrupting rating.
- 17 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection
- 18 for motor, transformer, welder, feeder, and main service protection.
- 19 C. 600 V. Fuses:
- 20 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 21 interrupting rating.
- 22 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection
- 23 for motor, transformer, welder, feeder and main service protection.
- 24 2. Class L, bolt-in 601 to 6,000 amps, 200,000-amp interrupting rating.
- 25 a. Gould Shawmut A48Y, time delay for overload and short circuit protection for motor,
- 26 transformer, feeder, and main service protection.
- 27 3. Class CC, fast acting, single element, 1/10 to 30 amps, 200,000-amp interrupting rating.
- 28 a. Gould Shawmut ATDR, UL listed for motor control circuits, lighting ballasts, control
- 29 transformers, and street lighting fixtures.
- 30 D. Spare Fuses:
- 31 1. 10%, minimum of 3, of each type and rating of installed fuses.
- 32 2.13 PANELBOARDS
- 33 A. Manufacturers:
- 34 1. Square D only to match building standard.
- 35 B. Panelboard Ratings:
- 36 1. UL listed short circuit rating (integral equipment rating):
- 37 a. Up to 240 V: 10,000 RMS symmetrical amp minimum.
- 38 b. Up to 480 V. 14,000 RMS symmetrical amp minimum.
- 39 c. As shown on Drawings.

- 1 C. Panelboard Construction:
- 2 1. Main breaker or main lugs only, per panelboard schedule.
- 3 2. Molded case circuit breakers.
- 4 3. Terminals:
- 5 a. UL listed for type or wire specified.
- 6 b. Anti-turn solderless compression type.
- 7 4. Bussing:
- 8 a. Distributed phase sequence type.
- 9 b. 225 amps, 98% conductivity hard drawn copper or as shown on panelboard schedule or
- 10 Drawings.
- 11 c. Copper.
- 12 d. Mounting hardware behind usable space.
- 13 5. Gutters adequate for wire size used, 4-inch minimum.
- 14 6. Boxes:
- 15 a. Code gauge galvanized steel.
- 16 b. Without knockouts.
- 17 7. Fronts:
- 18 a. Panel front cover shall have piano hinge to allow access to wiring gutters without
- 19 removal of panel trim. Hinged trim held in place with screw fasteners. Door shall be
- 20 built into trim, which allows access to breakers as well as to hinged trim screw
- 21 fasteners. Breaker access door shall have the following features:
- 22 i. Concealed piano hinge.
- 23 ii. Flush stainless steel cylinder tumbler type locks with spring loaded door pulls.
- 24 iii. Locks keyed alike.
- 25 iv. Rust inhibiting primer, baked enamel finish.
- 26 v. Dead front safety type.
- 27 vi. Concealed hinges and trim clamps..
- 28 vii. Circuit Directory:
- 29 viii. Suitable for complete descriptions.
- 30 ix. Clear plastic cover.
- 31 8. Typewritten card inside panel door.
- 32 9. Special features as shown on Drawings.
- 33 10. Code gauge steel.
- 34 11. Engraved laminated nameplate in accordance with Section 26 05 00.

35 2.14 MOLDED CASE CIRCUIT BREAKERS

36 A. Manufacturers:

- 37 1. Square D

38 B. Permanent Trip Circuit Breakers:

- 39 1. Lighting Panel Circuit Breakers:
- 40 a. Thermal and magnetic protection.
- 41 b. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
- 42 c. Bolt-on type unless otherwise noted on Drawings.
- 43 d. Quick make and break toggle action.

- 1 e. Handle trip indication.
- 2 f. Handle position indication, On, Off, and Tripped centered.
- 3 g. UL listed for type of wire specified.
- 4 h. UL listed short circuit rating (integrated equipment rating).
 - 5 i. Up to 240 V: 10,000 RMS symmetrical amp minimum.
 - 6 ii. Up to 480 V: 14,000 RMS symmetrical amp minimum.
- 7 i. UL SWDL switching duty on 120 v. circuits for switched circuits.
- 8 j. Switch neutral common trip per NEC 514-5 for fuel pumps.
- 9 2. Power Panel Circuit Breakers:
 - 10 a. Thermal and magnetic protection.
 - 11 b. Magnetic protection only in combination with motor starters and motor circuit
 - 12 protectors (MCP).
 - 13 c. Single magnetic trip adjustment.
 - 14 d. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
 - 15 e. Push-to-trip test button.
 - 16 f. Bolt-on type.
 - 17 g. Quick make and break toggle action.
 - 18 h. Handle trip indication.
 - 19 i. Handle position indication, On, Off, and Tripped centered.
 - 20 j. UL listed for type of wire specified.
 - 21 k. UL listed short circuit rating (integrated equipment rating).
 - 22 i. Up to 240 V: 10,000 RMS symmetrical amp minimum.
 - 23 ii. Up to 480 V: 14,000 RMS symmetrical amp minimum.

24 2.15 GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLES (GFCI)

- 25 A. Ratings:
 - 26 1. 120 VAC.
 - 27 2. 20 amp.
- 28 B. Tripping Requirement:
 - 29 1. UL Class A.
- 30 C. Construction:
 - 31 1. Shallow depth.
 - 32 2. Line and load terminal screws.
 - 33 3. Noise suppression.
 - 34 4. Feed through.
 - 35 5. Standard duplex wall plates shall fit.
 - 36 6. NEMA 5-20R configuration.
- 37 D. Meet requirements of UL 943 ground-fault circuit interrupters.

38 2.16 GROUNDING AND BONDING

- 39 A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings,
- 40 and quantities indicated are in excess of NEC requirements, more stringent requirements and greater size,
- 41 rating, and quantity indications govern.

- 1 B. Conductor Materials: Copper.
- 2 C. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- 3 D. Equipment Grounding Conductor: Green insulated.
- 4 E. Grounding Electrode Conductor: Stranded cable.
- 5 F. Bare Copper Conductors:
 - 6 1. Solid Conductors: ASTM B3.
 - 7 2. Assembly of Stranded Conductors: ASTM B8.
 - 8 3. Tinned Conductors: ASTM B33.
- 9 G. Ground Bus: Bar annealed copper bars of rectangular cross section.
- 10 H. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bar copper wire, terminated with copper
- 11 ferules.
- 12 I. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except as
- 13 indicated.
- 14 J. Connector Products
 - 15 1. General: Listed and labeled as grounding connectors for materials used.
 - 16 2. Pressure Connectors: High-conductivity-plated units.
 - 17 3. Bolted Clamps: Heavy-duty units listed for application.
 - 18 4. Exothermic Welded Connections: Provide in kit form and select for specific types, sizes, and
 - 19 combinations of conductors and other items to be connected.

20 PART 3 - EXECUTION

21 3.01 GENERAL

- 22 A. Install products in accordance with NEC, manufacturer's instructions, applicable standards, and
- 23 recognized industry practices to ensure products serve intended function.

24 3.02 CONDUITS AND CONDUIT FITTINGS

- 25 A. Complete conduit installation prior to installing cables.
- 26 B. Unless specifically indicated otherwise on Drawings, use rigid galvanized steel conduit for general
- 27 wiring.
- 28 C. Provide watertight conduit system where installed in wet places, underground or where buried in
- 29 masonry or concrete.
- 30 D. EMT conduit may be used for conduit sizes up to 4 inches.
- 31 E. Conduit shall be run concealed except exposed surface conduit may be installed where noted on
- 32 Drawings or where concealment found to be impractical or impossible, and only with approval of
- 33 ENGINEER.
- 34 F. Continuous from outlet to outlet and from outlets to cabinets, junction or pull boxes.

- 1 G. Enter and secure to boxes ensuring electrical continuity from point of service to outlets.
- 2 H. Conduit runs extending through areas of different temperature or atmospheric conditions or partly
3 indoors and partly outdoors shall be sealed, drained, and installed in manner preventing drainage of
4 condensed or entrapped moisture into cabinets, motors or equipment enclosures.
- 5 I. Run conduits within concrete structures parallel to each other and spaced on center of at least three times
6 conduit trade diameter with minimum 2-inch concrete covering. Conduits over 1 inch may not be
7 installed in slab without approval of ENGINEER.
- 8 J. Run exposed conduits parallel to or at right angles with lines of building.
- 9 K. Route conduit runs above suspended acoustical ceilings not interfering with tile panel removals.
- 10 L. Secure conduit in-place with not less than 1 malleable corrosion proof alloy strap or hanger per 8 feet of
11 conduit.
- 12 1. Do not use perforated strapping.
- 13 M. Connections to Motors and Equipment Subject to Vibration:
- 14 1. Flexible steel conduit not over 3 feet long or where exposed in mechanical and utility areas and
15 not subjected to moisture, dirt, and fumes.
- 16 2. Liquidtight flexible conduit not over 3 feet long where exposed in finished areas or where subject
17 to moisture, dirt, fumes, oil, corrosive atmosphere, exposed or concealed, with connectors to
18 ensure liquid tight, permanently grounded connection. Locate where least subject to physical
19 abuse.
- 20 N. Use double lock nuts and insulated bushings with threads fully engaged.
- 21 O. Connectors at fixture bodies and boxes shall be rigidly secured with galvanized lock nut and bushing.
- 22 P. Cap conduits after installation to prevent entry of debris.
- 23 Q. Install conduit expansion fittings complete with bonding jumper in following locations.
- 24 1. Conduit runs crossing structural expansion joint.
- 25 2. Conduit runs attached to two separate structures.
- 26 3. Conduit runs where movement perpendicular to axis of conduit may be encountered.
- 27 R. Install 4 feet-0 inch to 6 feet-0 inch flexible steel conduit drops from independent junction box mounted
28 above ceiling and accessible from below ceiling to recessed ceiling mounted equipment. Allow for
29 positioning of equipment to tile increments.
- 30 S. Negotiate beams and changes in ceiling heights with LB conduit fittings on outside corners and ells on
31 inside corners. Arrange bends and offsets in parallel conduits to present neat symmetrical appearance.
- 32 T. In precast areas, run conduits in insulation space or in floor topping without crossing conduits, using 3/4
33 in. maximum conduit size.
- 34 U. Core drill through reinforced concrete with approval of ENGINEER.
- 35 V. Split, crushed or scarred conduit not acceptable.
- 36 W. Do not route over boiler, incinerator or other high temperature equipment.
- 37 X. Flexible metal conduit can only be used for final connections to motors, transformers, or to light fixtures

1 above suspended ceilings.

2 3.03 SURFACE METAL RACEWAY

3 A. Mount to surface with No. 8 flathead fasteners or approved support clips.

4 B. Do not pinch wires.

5 C. Remove metal burrs and sharp edges.

6 D. Provide bushing.

7 E. Install in accordance with manufacturer's recommendations.

8 F. Provide covers where two lengths come together.

9 3.04 WIRE AND CABLE

10 A. Run wire and cable in conduit unless otherwise indicated on Drawings.

11 B. On branch circuits, use standard colors.

12 C. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with 2 half-lap layers of
13 vinyl plastic electrical tape and finish wrap of color coding tape, where required by code.

14 D. Run ground wire with power circuits; conduit shall not be grounding path.

15 E. Color Coding: Conductors for lighting and power wiring as indicated below.

16	<u>Phase</u>	<u>208/120V</u>	<u>480/277V</u>
17	A	Black	Brown
18	B	Red	Orange
19	C	Blue	Yellow
20	Neutral	White	Gray
21	Ground	Green	Green

22 3.05 BOXES

23 A. Install knockout closures to cap unused knockout holes where blanks have been removed.

24 B. Locate boxes to ensure accessibility of electrical wiring.

25 C. Secure boxes rigidly to subsurface upon which being mounted or solidly embed boxes in concrete or
26 masonry. Do not support from conduit.

27 D. Do not burn holes, use knockout punches or saw.

28 E. Provide outlet box accessories as required for each installation such as mounting brackets, fixture study,
29 cable clamps, and metal straps for supporting outlet boxes compatible with outlet boxes being used and
30 meeting requirements of individual wiring situations.

31 F. Location of outlets and equipment shown on Drawings is approximate. Verify exact location.

32 G. Minor modification in location of outlets and equipment is considered incidental up to distance of 10 feet

- 1 with no additional compensation, provided notification of modification is given prior to roughing in of
2 outlet.
- 3 H. Flush outlets shall have edges or plaster flush with finished wall or ceiling surfaces so plates can be
4 drawn tightly to wall or ceiling surfaces.
- 5 I. Mounting heights:
- 6 1. Shall conform to ADA guidelines.
- 7 2. In general, unless otherwise shown on Drawings:
- 8 a. Switches: 48 inches above floor to top of box.
- 9 b. AC Receptacles and Telephone Outlets: 15 inches above floor to bottom of box or 6
10 inches above counters, counter backsplashes in finished areas; 48 inches to top of box
11 above floor in unfinished areas.
- 12 c. Wall Bracket Lighting Fixtures: 8 inches above mirrors or 6 feet-6 inches above floor.
- 13 d. Pushbuttons: 48 inches above floor to top of box.
- 14 e. Motor Starters and Disconnect Switches: 60 inches above floor.
- 15 i. Thermostats: 48 inches above floor.
- 16 f. Bells and Horns: 8 feet-0 inches above floor.
- 17 g. Clocks: 8 ft.-0 inches above floor.
- 18 h. Fire Alarm visual signals 80" above floor.
- 19 i. Emergency Battery Units: 8 ft. - 0 inches above floor or 12" below ceiling.
- 20 J. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall,
21 minimum 12 inches.
- 22 K. Where emergency switches occur adjacent to normal light switches, install in separate boxes in
23 accordance with NEC and device plate color coding separation.
- 24 L. Light Fixture Outlet Boxes:
- 25 1. Securely mount with approved type bar hangers spanning structural members to support weight of
26 fixture.
- 27 2. Do not support from conduit.
- 28 3. Equip with 3/8-inches fixture stud and tapped fixture ears.
- 29 3.06 FIRE RATED THROUGH FLOOR FITTINGS
- 30 A. Spacing and location as noted on Drawing.
- 31 B. Install in accordance with manufacturer's instructions.
- 32 3.07 WIRING DEVICES
- 33 A. Do not install devices until wiring is complete.
- 34 B. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or
35 otherwise. Make circuit connections by using wire connectors and pigtails.
- 36 C. Install gasket plates for devices or system components having light emitting features such as switch with
37 pilot light and dome lights. Where installed on rough textured surfaces, seal with black self-adhesive
38 polyfoam.

- 1 D. Ground receptacles with insulated green ground wire from device ground screw to bolted outlet box
2 connection or as shown on Drawings.
- 3 E. Wrap wiring devices with insulating tape.
- 4 F. Install emergency switches which occur adjacent to normal light switches in separate boxes to maintain
5 systems isolation in accordance with NEC.
- 6 3.08 MOTOR STARTERS
- 7 A. Examine area to receive motor starters to ensure adequate clearance for starter installation.
- 8 B. Anchor firmly to wall or structural surface.
- 9 3.09 MOTOR AND CIRCUIT DISCONNECTS.
- 10 A. Locate disconnect switches as shown on Drawings and required by NEC.
- 11 B. Provide control circuit interlock as required by NEC.
- 12 3.10 OVERCURRENT PROTECTIVE DEVICES.
- 13 A. Install fuses just prior to energizing equipment.
- 14 B. Locate circuit breakers as shown on Drawings.
- 15 C. Install GFCI receptacles as required by NEC.
- 16 3.11 PANELBOARDS
- 17 A. Flush or surface mount as specified on drawings and schedules.
- 18 B. Support panel cabinets independently to structure with no weight bearing on conduits.
- 19 C. Install recessed panelboards to allow cover to be drawn tight against wall to provide neat appearance.
- 20 D. Install panelboards so top breaker is not higher than 6 feet-0 inches above floor.
- 21 E. Adjacent panel cabinets shall be same size and mounted in horizontal alignment.
- 22 F. Install typewritten directory in each panelboard, accurately indicating rooms or equipment being served
23 after final circuit changes have been made to balance circuit loads.
- 24 G. Install four spare 1 inch conduits from top of each flush mounted panelboard to area above ceiling for
25 future use. On flush mounted panelboards located on first and higher level floors, provide two spare 1
26 inch conduits from bottom of panelboard to ceiling area of floor below for future use.
- 27 3.12 GROUNDING AND BONDING
- 28 A. Application
- 29 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and
30 quantities of equipment grounding conductors, except where larger sizes or more conductors are
31 indicated.

- 1 a. Install separate insulated equipment grounding conductors with circuit conductors.
2 Raceway may be used as equipment ground conductor where feasible in non-hazardous
3 areas and permitted by NEC for lighting circuits. Install insulated equipment ground
4 conductor in nonmetallic raceways unless designated for telephone or data cables.
- 5 2. Underground Conductors: Bare tinned, stranded copper except otherwise indicated.
- 6 3. Signal and Communications: For telephone, alarm, instrumentation and communication systems,
7 provide #4 AWG minimum green insulated copper conductor in raceway from grounding
8 electrode system to each terminal cabinet or central equipment location.
- 9 4. Ground separately derived systems required by NEC to be grounded in accordance with NEC
10 paragraph 250-26.
- 11 5. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to grounding electrode as
12 indicated in addition to separate equipment grounding conductor run with supply branch circuit.
- 13 6. Connections to Lighting Protection System: Bond grounding conductors or grounding conductor
14 conduits to lighting protection down conductors or grounding conductors in compliance with
15 NFPA 78.

16 B. Installation

- 17 1. General: Ground electrical systems and equipment in accordance with NEC requirements except
18 where Drawings or Specifications exceed NEC requirements.
- 19 2. Ground Rods:
 - 20 a. Locate minimum of one-rod length from each other and at least same distance from any
21 other grounding electrode.
 - 22 b. Interconnect ground rods with bare conductors buried at least 24 inches below grade.
 - 23 c. Connect bare-cable ground conductors to ground rods by means of exothermic welds
24 except as otherwise indicated.
 - 25 d. Make connections without damaging copper coating or exposing steel.
 - 26 e. Use 3/4-inch by 10-foot ground rods except as otherwise indicated.
 - 27 f. Drive rods until tops are 6 inches below finished floor or final grade except as
28 otherwise indicated.
- 29 3. Metallic Water Service Pipe:
 - 30 a. Provide insulated copper ground conductors, sized as indicated, in conduit from
31 building main service equipment, or ground bus, to main metallic water service
32 entrances to building.
 - 33 b. Connect ground conductors to street side of main metallic water service pipes by means
34 of ground clamps.
 - 35 c. Bond ground conductor conduit to conductor at each end.
- 36 4. Braided-Type Bonding Jumpers:
 - 37 a. Use elsewhere for flexible bonding and grounding connections.
- 38 5. Route grounding conductors along shortest and straightest paths possible without obstructing
39 access or placing conductors where they may be subjected to strain, impact, or damage, except as
40 indicated.

41 C. Connections

- 42 1. General: Make connections to minimize possibility of galvanic action or electrolysis. Select
43 connectors, connection hardware, conductors, and connection methods so metals in direct contact
44 will be galvanically compatible.
 - 45 a. Use electroplated or hot-tin-coated materials to assure high conductivity and make
46 contact points closer in order of galvanic series.
 - 47 b. Make connections with clean bare metal at points of contact.
 - 48 c. Aluminum to steel connections: stainless steel separators and mechanical clamps.

- 1 d. Aluminum to galvanized steel connections: tin-plated copper jumpers and mechanical
- 2 clamps.
- 3 e. Coat and seal connections involving dissimilar metals with inert material such as red
- 4 lead paint to prevent future penetration of moisture to contact surfaces.
- 5 2. Exothermic Welded Connections:
- 6 a. Use for connections to structural steel and for underground connections except those at
- 7 test wells.
- 8 b. Install at connections to ground rods and plate electrodes.
- 9 c. Comply with manufacturer's written recommendations.
- 10 d. Welds that are puffed up or that show convex surfaces indicating improper cleaning are
- 11 not acceptable.
- 12 3. Terminations:
- 13 a. Terminate insulated equipment grounding conductors for feeders and branch circuits
- 14 with pressure-type grounding lugs.
- 15 b. Where metallic raceways terminate at metallic housings without mechanical and
- 16 electrical connection to housing, terminate each conduit with grounding bushing.
- 17 c. Connect grounding bushings with bare grounding conductor to ground bus in housing.
- 18 d. Bond electrically noncontinuous conduits at both entrances and exist with grounding
- 19 bushings and bare grounding conductors.

20 3.13 FIELD QUALITY CONTROL

- 21 A. Control Circuits, Branch Circuits, Feeders, Motor Circuits, and transformers :
- 22 1. Megger check to phase-to-phase and phase-to-ground insulation levels.
- 23 a. Do not megger check solid state equipment.
- 24 2. Continuity.
- 25 3. Short circuit.
- 26 4. Operational check.
- 27 B. Wiring Devices:
- 28 1. Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity, proper
- 29 ground connection, and wiring faults.

30 3.14 ADJUSTMENT AND CLEANING

- 31 A. Motor Starters and Disconnects:
- 32 1. Adjust covers and operating mechanisms for free mechanical movement.
- 33 2. Tighten wire and cable connections.
- 34 3. Verify overcurrent protection thermal unit size with motor nameplate to provide proper operation
- 35 and compliance with NEC.
- 36 4. Clean interior of enclosures.
- 37 5. Touch up scratched or marred surfaces to match original finish.
- 38 B. Circuit Breakers:
- 39 1. Adjustable settings shall be set to provide selective coordination, proper operation, and
- 40 compliance with NEC.
- 41 C. Restore damaged areas on PVC jacketed rigid conduit with spray type touch-up coating compound or as
- 42 directed by manufacturer.

1 D. Pull cleaning plug through conduits to clear of dirt, oil, and moisture.

2 END OF SECTION 26 20 00

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SECTION 26 51 13

LIGHTING

PART 1 - GENERAL

1.01 SCOPE

- A. General Conditions of Contract and portions of Division 01 of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Section Includes:

1. Interior lighting fixtures.
2. Exterior lighting fixtures.
3. Lamps.
4. Ballasts.
5. Emergency lighting units.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):

1. C78 Series - Lamps.
2. C82.2-84 - Fluorescent Lamp Ballasts.
3. C82.4-85 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
4. ANSI C2-90 - National Safety Code.

- B. Institute of Electrical and Electronics Engineers (IEEE):

1. C62.41-91 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

- C. National Fire Protection Association (NFPA):

1. 70-93 - National Electric Code.

- D. Underwriters Laboratory (UL):

1. 844-90 - UL Standard for Safety Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
2. 924-90 - UL Standard for Safety Emergency Lighting and Power Equipment.
3. 935-84 - UL Standard for Safety Florescent-Lamp Ballast.
4. 1092 (P) - UL Standard for Safety Proposed First Edition of the Standard for Process Control Equipment.
5. 1570-88 - UL Standard for Safety Florescent Lighting Fixtures.
6. 1571-91 - UL Standard for Safety Incandescent Lighting Fixtures.
7. 1572-91 - UL Standard for Safety High Intensity Discharge Lighting Fixtures.
8. 1573-85 - UL Standard for Safety Stage and Studio Lighting Units.
9. 1574-87 - UL Standard for Safety Track Lighting Systems.
10. UL 773-87 - UL Standard for Safety Plug-In, Locking Type Photo controls for Use with Area Lighting.

- 1 1.04 DEFINITIONS
- 2 A. Fixture: Complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts
3 required to distribute light, position and protect lamps, and connect lamps to power supply. Internal
4 battery powered exit signs and emergency lighting units also include battery and means for controlling
5 and recharging battery. Emergency lighting units are available with and without integral lamp heads and
6 lamps.
- 7 B. Luminaire: Fixture.
- 8 C. Average Life: Time after which 50% will have failed and 50% will have survived under normal
9 conditions.
- 10 1.05 SUBMITTALS
- 11 A. Product Data:
- 12 1. Describe fixtures, lamps, ballasts, poles, emergency lighting units, and accessories. Arrange
13 product data for fixtures in order of fixture designation. Include data on features and accessories
14 and following information:
- 15 Outline drawings of fixtures indicating dimensions and principal features.
- 16 Electrical ratings and photometric data with specified lamps and certified results of
17 independent laboratory tests.
- 18 Data on batteries and chargers of emergency lighting units.
- 19 B. Shop Drawings: Detail nonstandard fixtures and indicating dimensions, weights, methods of field
20 assembly, components, features, and accessories.
- 21 C. Miscellaneous:
- 22 1. For substitutes only, product certifications signed by manufacturers of lighting fixtures certifying
23 that their fixtures comply with specified requirements.
- 24 2. Coordination drawings for fixtures that require coordination with other equipment installed in
25 same space.
- 26 D. Submit in accordance with Division 01.
- 27 1.06 QUALITY ASSURANCE
- 28 A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized
29 Testing Laboratory (NRTL).
- 30 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- 31 2. Terms "listed" and "labeled" shall be as defined in National Electric Code, Article 100.
- 32 B. Regulatory Requirements:
- 33 1. National Electric Code: Components and installation shall comply with NFPA 70.
- 34 2. Comply with ANSI C2, "National Electrical Safety Code".
- 35 C. Coordinate fixtures mounting hardware and trim with ceiling tile.
- 36

- 1 1.07 WARRANTY
- 2 A. Requirements:
- 3 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to
- 4 weathering.
- 5 2. Color Retention: Warranty against fading, staining, chalking due to effects of weather and solar
- 6 radiation.
- 7 PART 2 - PRODUCTS
- 8 2.01 FIXTURES, GENERAL
- 9 A. Comply with requirements specified in Articles below and lighting fixture schedule.
- 10 2.02 FIXTURE COMPONENTS, GENERAL
- 11 A. Metal Parts: Free from burrs, sharp corners, and edges.
- 12 B. Sheet Metal Components: Steel, except as indicated. Form and support components to prevent warping
- 13 and sagging.
- 14 C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under
- 15 operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames, lenses,
- 16 diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating
- 17 position.
- 18 D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
- 19 1. White surfaces: 85%.
- 20 2. Specular Surfaces: 83%.
- 21 3. Diffusing Specular Surfaces: 75%.
- 22 4. Laminated Silver Metallized Film: 90%.
- 23 E. Exterior Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform
- 24 in use. Provide filter/breather for enclosed fixtures.
- 25 F. Exterior Exposed Hardware Material: Stainless steel.
- 26 G. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal glass
- 27 except as indicated.
- 28 1. Plastic: Highly resistant to yellowing and other changes due to aging, exposure to heat and UV
- 29 radiation.
- 30 2. Lens Thickness: 0.125 inches, minimum.
- 31 H. Photoelectric Relay: UL 773.
- 32 1. Contact Relays: Single-throw, arranged to fail in the "on" position and factory set to turn light
- 33 unit on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles with 15 seconds minimum time
- 34 delay.
- 35 2. Relay Mounting: In fixture housing.
- 36 2.03 SUSPENDED FIXTURE SUPPORT COMPONENTS
- 37 A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as

- 1 fixture.
- 2 B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount single fixture.
3 Finish same as fixture.
- 4 C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
- 5 D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded
6 attachment, cord, and locking-type plug.

7 2.04 LED FIXTURES

- 8 A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification
9 Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified
10 Products List, but they must meet the Product Qualification Criteria. The technical requirements that the
11 luminaire shall meet for each Application Category are:
- 12 1. Minimum Light Output.
 - 13 2. Zonal Lumen Requirements.
 - 14 3. Minimum Luminaire Efficacy.
 - 15 4. Minimum CRI.
 - 16 5. L70 Lumen Maintenance.
 - 17 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED
18 components.

19 **Additional requirements:**

- 20 B. Color Temperature of 3000K-5000K for interior fixtures as listed in the Light Fixture Schedule on the
21 plans. The color temperature of exterior LED fixtures should not exceed 4100K (nominal).
22
- 23 C. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to
24 achieve consistent fixture-to-fixture color for interior fixtures. Exterior fixtures shall use a maximum 5-
25 step MacAdam Ellipse binning process.
26
- 27 D. Glare Control: Exterior fixtures shall meet DesignLights Consortium's® criteria for Zonal Lumen
28 Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior fixtures.
29
- 30 E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- 31
- 32 F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
33
- 34 G. Light output of the LED system shall be measured using the absolute photometry method following IES
35 LM-79 and IES LM-80 requirements and guidelines.
36
- 37 H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
38
- 39 I. Driver shall have a rated life of 50,000 hours, minimum.
40
- 41 J. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
42
- 43 K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
44
- 45 L. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior fixtures, and a minimum
46 of 70 for exterior fixtures.
47
- 48 M. LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the LED
49 for the ambient temperature of the location the fixture is to be installed. Rated case temperature shall be
50 suitable for operation in the ambient temperatures typically found for the intended installation. Exterior
51 luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
52

- 1 N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full
2 input power and across specified voltage range.
3
4 O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
5
6 P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and
7 across specified voltage range.
8
9 Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
10
11 R. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in
12 the event connections are reversed or shorted during the installation process.
13
14 S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be
15 either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2
16 UL listing.
17
18 T. All luminaires shall be provided with knockouts for conduit connections.
19
20 U. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light engine(s)/board
21 array, and driver(s).
22
23 V. Provide all of the following data on submittals:
24 1. Delivered lumens
25 2. Input watts
26 3. Efficacy
27 4. Color rendering index.
28

29 **Emergency LED Fixture Compatibility with Inverters:**

- 30 W. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire
31 manufacturer that the fixture will function with a square-wave inverter.
32

33 **Dimming:**

- 34 X. LED driver shall be compatible with dimming controls where dimming is indicated on the plans.
35 Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM)
36 operation.
37
38 Y. LED fixtures shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Light Fixture Schedule on
39 the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the fixture being on a
40 pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when
41 power is returned to the fixture.

42 2.05 FIXTURES FOR HAZARDOUS LOCATIONS

- 43 A. Conform to UL 844 or provide units that have Factory Mutual Engineering and Research Corporation
44 (FM) certification for indicated class and division of hazard.

45 2.06 TRACK LIGHTING SYSTEMS

- 46 A. Conform to UL 1574. Provide components, including track, fittings, and fixtures from same
47 manufacturer, and as recommended by manufacturer for intended purpose.
48 B. Stage and Studio Lighting Equipment: Conform to UL 1573.

49 2.07 EXIT SIGNS

- 50 A. Conform to UL 924.

- 1 1. Sign Colors: Conform to local code.
- 2 B. Self-Powered Exit Signs (Battery Type): Integral automatic high/low trickle charger in self-contained
3 power pack.
- 4 1. Battery: Sealed, maintenance-free, nickel cadmium type with special project warranty.
- 5 2.08 LAMPS
- 6 A. Conform to ANSI C78 series applicable to each type of lamp.
- 7 2.09 FINISH
- 8 A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs,
9 holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project
10 warranty period and replace with new fixtures.
- 11 B. Other Parts: Manufacturer's standard finish.
- 12 C. Verify and provide light fixture finishes as selected by ARCHITECT for all light fixture types. Include
13 colored finish selection tables with product submittals. Upon request submit actual material finish
14 swatches for A/E review.
- 15 PART 3 - EXECUTION
- 16 3.01 INSTALLATION
- 17 A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to
18 manufacturer's printed instructions and approved submittals.
- 19 B. Support For Recessed and Semirecessed Fixtures: Units may be supported from suspended ceiling
20 support system. Install ceiling system support rods or wires at minimum of four rods or wires per fixture
21 located not more than 6 inches from fixture corners.
- 22 1. Fixtures Smaller Than Ceiling Grid: Install minimum of four rods or wires for each fixture and
23 locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling
24 acoustical panels.
- 25 2. Fixtures of Sizes Less Than Ceiling Grid: Center in acoustical panel. Support fixtures
26 independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- 27 3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near
28 each fixture corners.
- 29 C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging.
30 Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers. For
31 continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit
32 length of chassis, including one at each end.
- 33 D. Lamping: Lamp units according to manufacturer's instructions.
- 34 3.02 GROUNDING
- 35 A. Ground fixtures and metal poles according to Section 26 20 00.
- 36 3.03 FIELD QUALITY CONTROL
- 37 A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

- 1 B. Give 7-day notice of dates and times for field tests.
- 2 C. Verify normal operation of each fixture after fixtures have been installed and circuits have been
3 energized with normal power source.
- 4 D. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation.
- 5 1. Duration of supply.
- 6 2. Low battery voltage shut-down.
- 7 3. Normal transfer to battery source and retransfer to normal.
- 8 4. Low supply voltage transfer.
- 9 E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until units
10 operate properly.
- 11 3.04 ADJUSTING AND CLEANING
- 12 A. Clean fixtures upon completion of installation. Use methods and materials recommended by
13 manufacturer.
- 14 B. Adjust aimable fixtures to provide required light intensities.

15 END OF SECTION 26 51 13

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SECTION 27 10 00

TELECOMMUNICATIONS DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. The basic scope of this project is as follows:

1. Remove abandoned cables back to origin.
2. Provide new cables and patch panels.
3. Provide all certification and testing of the equipment and cabling as required.

B. Section Includes: Equipment, materials, labor, and services to provide telephone and data distribution system including, but not limited to:

1. Raceway and boxes
2. Telephone and data cabling terminations
3. Telecommunications outlets
4. Terminal blocks/cross-connect systems
5. System testing
6. Documentation and submissions

C. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

D. Work not included:

1. The following work will be done by others:
 - a. Off-site services.
 - b. Providing data concentrators, hubs, servers, computers, and other active devices.

1.02 REFERENCES

A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code®), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:

1. ANSI/NECA/BICSI-568 -- Standard for Installing Commercial Building Telecommunications Cabling
2. ANSI/TIA/EIA Standards
 - a. ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
 - b. ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
 - c. ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
 - d. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
 - e. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - f. ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding Requirements

- 1 for Telecommunications
- 2 g. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode
- 3 Fiber Cable Plant
- 4 h. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed
- 5 Multimode Fiber Cable Plant
- 6 i. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications
- 7 Cabling Standard
- 8 B. Install cabling in accordance with the most recent edition of BICSI® publications:
- 9 1. BICSI -- Telecommunications Distribution Methods Manual
- 10 2. BICSI -- Cabling Installation Manual
- 11 3. BICSI -- LAN Design Manual
- 12 4. BICSI -- Customer-Owned Outside Plant Design Manual
- 13 C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of
- 14 the specifications as if herein repeated or hereto attached. If the contractor should note items in the
- 15 drawings or the specifications, construction of which would be code violations, promptly call them to the
- 16 attention of the owner's representative in writing. Where the requirements of other sections of the
- 17 specifications are more stringent than applicable codes, rules, regulations, and ordinances, the
- 18 specifications shall apply.
- 19 1.03 PERMITS, FEES, AND CERTIFICATES OF APPROVAL
- 20 A. As prerequisite to final acceptance, supply to the owner certificates of inspection from an inspection
- 21 agency acceptable to the owner and approved by local municipality and utility company serving the
- 22 project.
- 23 1.04 SYSTEM DESCRIPTION
- 24 A. Telecommunications cabling system generally consists of one telecommunications outlet in each
- 25 workstation, wall telephones in common and mechanical areas and telecommunications rooms (TRs)
- 26 located on each floor.
- 27 1. For this project, the telecommunications rooms are existing.
- 28 2. The equipment room (ER) is currently existing and is located on the 5th Floor of the City-County
- 29 Building.
- 30 B. The typical work area consists of a single-gang plate with up to six standards compliant work area
- 31 outlets.
- 32 1. Each work area outlet consists of one (1) four-pair data Category 6 cable or above, installed from
- 33 work area outlet to the TR. Terminate data cables on rack mounted modular patch panels located
- 34 in the appropriate TR.
- 35

1 1.05 SUBMITTALS

2 A. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog
3 information), and samples required by the contract documents. Submit shop drawings, product data, and
4 samples with such promptness and in such sequence as to cause no delay in the work or in the activities
5 of separate contractors. The engineer/designer will indicate approval of shop drawings, product data, and
6 samples submitted to the engineer by stamping such submittals "APPROVED" with a stamp. Submitted
7 shop drawings shall be initialed or signed by the contractor, showing the date and the contractor's
8 legitimate firm name.

9 1. By submitting shop drawings, product data, and samples, the contractor represents that he or she
10 has carefully reviewed and verified materials, quantities, field measurements, and field
11 construction criteria related thereto. It also represents that the contractor has checked,
12 coordinated, and verified that information contained within shop drawings, product data, and
13 samples conform to the requirements of the work and of the contract documents. The
14 engineer/designer remains responsible for the design concept expressed in the contract documents
15 as defined herein.

16 2. The engineer's/designer's approval of shop drawings, product data, and samples submitted by the
17 contractor shall not relieve the contractor of responsibility for deviations from requirements of the
18 contract documents, unless the contractor has specifically informed the engineer/designer in
19 writing of such deviation at time of submittal, and the engineer/designer has given written
20 approval of the specific deviation. The contractor shall continue to be responsible for deviations
21 from requirements of the contract documents not specifically noted by the contractor in writing,
22 and specifically approved by the engineer in writing.

23 3. The engineer's/designer's approval of shop drawings, product data, and samples shall not relieve
24 the contractor of responsibility for errors or omissions in such shop drawings, product data, and
25 samples.

26 4. The engineer's/designer's review and approval, or other appropriate action upon shop drawings,
27 product data, and samples, is for the limited purpose of checking for conformance with
28 information given and design concept expressed in the contract documents. The
29 engineer's/designer's review of such submittals is not conducted for the purpose of determining
30 accuracy and completeness of other details such as dimensions and quantities, or for substantiating
31 instructions for installation or performance of equipment or systems, all of which remain the
32 responsibility of the contractor as required by the contract documents. The review shall not
33 constitute approval of safety precautions or of construction means, methods, techniques,
34 sequences, or procedures. The engineer's/designer's approval of a specific item shall not indicate
35 approval of an assembly of which the item is a component.

36 B. Perform no portion of the work requiring submittal and review of shop drawings, product data, or
37 samples, until the engineer/designer has approved the respective submittal. Such work shall be in
38 accordance with approved submittals.

39 C. Submit shop drawings, product data, and samples electronically as a complete set within thirty (30) days
40 of award of contract.

41 D. General: Submit the following:

- 42 1. Bill of materials, noting long lead time items
- 43 2. Optical loss budget calculations for each optical fiber run
- 44 3. Project schedule including all major work components that materially affect any other work on the
45 project

46 E. Shop drawings: Submit the following:

- 47 1. Backbone (riser) diagrams.

- 1 2. System block diagram, indicating interconnection between system components and subsystems.
- 2 3. Interface requirements, including connector types and pin-outs, to external systems and systems or
- 3 components not supplied by the contractor.
- 4 4. Fabrication drawings for custom-built equipment.
- 5 F. Product Data -- Provide catalog cut sheets and information for the following:
- 6 1. Wire and cable
- 7 2. Outlets, jacks, faceplates, and connectors
- 8 3. All metallic and nonmetallic raceways, including surface raceways, outlet boxes, and fittings
- 9 4. Terminal blocks and patch panels
- 10 G. Project record drawings:
- 11 1. Submit project record drawings at conclusion of the project and include:
- 12 a. Approved shop drawings
- 13 b. Plan drawings indicating locations and identification of work area outlets, nodes,
- 14 telecommunications rooms (TRs), and backbone (riser) cable runs
- 15 c. Telecommunications rooms (TRs) and equipment room (ER and/or MC) termination
- 16 detail sheets.
- 17 d. Cross-connect schedules including entrance point, main cross-connects, intermediate
- 18 cross-connects, and horizontal cross-connects.
- 19 e. Labeling and administration documentation.
- 20 f. Warranty documents for equipment.
- 21 g. Copper certification test result printouts and diskettes.
- 22 (a.) Optical fiber power meter/light source test results.

23 1.06 **QUALITY ASSURANCE**

- 24 A. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type
- 25 and size.
- 26 B. Upon request by the engineer/designer, furnish a list of references with specific information regarding
- 27 type of project and involvement in providing of equipment and systems.
- 28 C. Equipment and materials of the type for which there are independent standard testing requirements,
- 29 listings, and labels, shall be listed and labeled by the independent testing laboratory.
- 30 D. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA - National
- 31 Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with
- 32 standards.
- 33 E. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment
- 34 and materials of the same type shall be a product of the same manufacturer throughout.
- 35 F. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes
- 36 toward the owner and engineer/designer.

37 1.07 **WARRANTY**

- 38 A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and
- 39 workmanship for a period of not less than fifteen (15) years from date of acceptance by the owner. The
- 40 owner shall deem acceptance as beneficial use.

1 B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit
2 these warranties on each item in list form with shop drawings. Detail specific parts within equipment
3 that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved
4 in this contract during the guarantee period. Final payment shall not relieve you of these obligations.

5 1.08 DELIVERY, STORAGE, AND HANDLING

6 A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and
7 misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not store
8 equipment where conditions fall outside manufacturer's recommendations for environmental conditions.
9 Do not install damaged equipment; remove from site and replace damaged equipment with new
10 equipment.

11 1.09 SEQUENCE AND SCHEDULING

12 A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and testing for
13 conformance to specific job completion dates. As a minimum, dates are to be provided for bid award,
14 installation start date, completion of station cabling, completion of riser cabling, completion of testing
15 and labeling, cutover, completion of the final punch list, start of demolition, owner acceptance, and
16 demolition completion.

17 1.10 USE OF THE SITE

18 A. Use of the site shall be at the owner's direction in matters in which the owner deems it necessary to place
19 restriction.

20 B. Access to building wherein the work is performed shall be as directed by the owner.

21 C. The owner will occupy the premises during the entire period of construction for conducting his or her
22 normal business operations. Cooperate with the owner to minimize conflict and to facilitate the owner's
23 operations.

24 D. Schedule necessary shutdowns of plant services with the owner, and obtain written permission from the
25 owner. Refer to article - CONTINUITY OF SERVICES herein.

26 E. Proceed with the work without interfering with ordinary use of streets, aisles, passages, exits, and
27 operations of the owner.

28 1.11 CONTINUITY OF SERVICES

29 A. Take no action that will interfere with, or interrupt, existing building services unless previous
30 arrangements have been made with the owner's representative. Arrange the work to minimize shutdown
31 time.

32 B. Owner's personnel will perform shutdown of operating systems. The contractor shall give three (3) days'
33 advance notice for systems shutdown.

34 C. Should services be inadvertently interrupted, immediately furnish labor, including overtime, material,
35 and equipment necessary for prompt restoration of interrupted service.

36 PART 2 - PRODUCTS

37 2.01 MANUFACTURERS

38 A. Hubbell, Ortronics, Panduit

- 1 1. Or any other approved equivalent manufacturer that meets the performance requirements of this
2 specification. Category 6 performance is standard.
- 3 2. Contractor shall be a certified installer.
- 4 B. Berk-Tek
- 5 C. Belden
- 6 D. Mohawk
- 7 E. Commscope
- 8 F. Superior Essex
- 9 G. Optical Cable Corporation
- 10 2.02 FABRICATION
- 11 A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional
12 aspects of equipment and its installation.
- 13 2.03 SUITABILITY
- 14 A. Provide products that are suitable for intended use, including, but not limited to environmental,
15 regulatory, and electrical.
- 16 2.04 STATION CABLE
- 17 A. VOICE TELECOMMUNICATIONS STATION CABLE
- 18 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four
19 individually twisted-pairs, which meet or exceed the mechanical and transmission performance
20 specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.
- 21 a. Listed Type CMP (as required in the NEC 2017).
- 22 B. DATA STATION CABLE (Copper)
- 23 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four
24 individually twisted-pairs, which meet or exceed the mechanical and transmission performance
25 specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.
- 26 a. Listed Type CMP (as required in the NEC 2017).
- 27 2.05 WORK AREA OUTLETS
- 28 A. VOICE/DATA WORK AREA OUTLETS (Copper only)
- 29 1. Single-gang mounting plate with six (6) openings containing the following devices (see drawings
30 for quantity):
- 31 a. Voice Outlet - 8-pin modular, Category 6, unkeyed, white, pinned to T568A standards.
- 32 b. Data Outlet - 8-pin modular, Category 6, unkeyed, blue, pinned to T568A standards.
- 33 2. The device color of outlets and jacket color for cabling that will be used on the project shall be
34 coordinated with the Dane County Information Technology (IT) Department prior to the
35 beginning of any work. It is intended that the Dane County standard being maintained.
- 36

- 1 B. WALL VOICE OUTLETS
- 2 1. Single-gang stainless steel faceplate with six-conductor jack and wall telephone mounting lugs
- 3 C. DATA ONLY WORK AREA OUTLET
- 4 1. Single-gang faceplate with 8-pin modular, category 6, unkeyed, blue data jack, pinned to T568A
- 5 standards
- 6 D. VOICE ONLY WORK AREA OUTLET
- 7 1. Single-gang faceplate with 8-pin modular, category 6, unkeyed, white telephone jack, pinned to
- 8 T568A standards
- 9 2.06 PATCH PANELS
- 10 A. 19 in. rack mountable, 24-port 8-pin modular to insulation displacement connector (IDC) meeting
- 11 Category 6 performance standards and pinned to T568A standard.

12 PART 3 - EXECUTION

13 3.01 PRE-INSTALLATION SITE SURVEY

- 14 A. Prior to start of systems installation, meet at the project site with the owner's representative and
- 15 representatives of trades performing related work to coordinate efforts. Review areas of potential
- 16 interference and resolve conflicts before proceeding with the work. Facilitation with the General
- 17 Contractor will be necessary to plan the crucial scheduled completions of the equipment room and
- 18 telecommunications closets.
- 19 B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work
- 20 until satisfactory conditions have been achieved.
- 21 C. The contractor shall be responsible for meeting with the Owner's (Dane County) Information
- 22 Technology staff prior to the start of any installation to coordinate the work to be installed as part of this
- 23 project. It is the design intent to maintain any cabling or installation standards that are currently in use
- 24 by Dane County.
- 25 1. Failure to perform this meeting may cause work to be removed and reinstalled if not deemed
- 26 acceptable by Dane County.

27 3.02 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- 28 A. Be responsible for safekeeping of your own and your subcontractors' property, such as equipment and
- 29 materials, on the job site. The owner assumes no responsibility for protection of above named property
- 30 against fire, theft, and environmental conditions.

31 3.03 PROTECTION OF OWNER'S FACILITIES

- 32 A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during
- 33 construction.
- 34 B. Remove protection at completion of the work.

35 3.04 INSTALLATION

- 36 A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as
- 37 part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading,
- 38 setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting

1 wiring of system components, equipment alignment and adjustment, and other related work whether or
2 not expressly defined herein.

3 B. Install materials and equipment in accordance with applicable standards, codes, requirements, and
4 recommendations of national, state, and local authorities having jurisdiction, and National Electrical
5 Code® (NEC) and with manufacturer's printed instructions.

6 C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall
7 pressure when installing cables.

8 1. Where manufacturer does not provide bending radii information, minimum-bending radius shall
9 be 15 times cable diameter. Arrange and mount equipment and materials in a manner acceptable
10 to the engineer and the owner.

11 D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or
12 galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing a
13 firestopping assembly approved for that application.

14 E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.

15 F. Installation shall conform to the following basic guidelines:

16 1. Use of approved wire, cable, and wiring devices

17 2. Neat and uncluttered wire termination

18 G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support
19 cables installed above removable ceilings.

20 H. Install adequate support structures for 10 foot of service slack at each TR.

21 I. Support riser cables every three (3) floors and at top of run with cable grips.

22 1. Limit number of four-pair data riser cables per grip to fifty (50)

23 J. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the drawings
24 or noted below:

25 K. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with
26 power conductors.

27 3.05 GROUNDING

28 A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and Bonding
29 Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and
30 manufacturer's grounding requirements as minimum.

31 B. Bond and ground equipment racks, housings, messenger cables, and raceways.

32 C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system
33 via #6 AWG green insulated copper grounding conductor.

34 3.06 LABELING

35 A. Labeling shall conform to ANSI/TIA/EIA-606(A) standards. In addition, provide the following:

36 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.

37 2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the

1 following locations:

- 2 a. Inside receptacle box at the work area.
- 3 b. Behind the communication closet patch panel or punch block.
- 4 c. Use labels on face of data patch panels. Provide facility assignment records in a
5 protective cover at each telecommunications closet location that is specific to the
6 facilities terminated therein.
- 7 d. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-
8 606(A) standard color codes for termination blocks.
- 9 e. Mount termination blocks on color-coded backboards.
- 10 f. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
- 11 g. Label cables, outlets, patch panels, and punch blocks with room number in which outlet
12 is located, followed by a single letter suffix to indicate particular outlet within room,
13 i.e., S2107A, S2107B. Indicate riser cables by an R then pair or cable number.
- 14 h. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn
15 these drawings over to the owner two (2) weeks prior to move in to allow the owner's
16 personnel to connect and test owner-provided equipment in a timely fashion.
- 17 i. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks
18 of acceptance of project by the owner. A set of as-built drawings shall be provided to
19 the owner in magnetic media form (3.5" floppy disks) and utilizing CAD software that
20 is acceptable to the owner. The magnetic media shall be delivered to the owner wi thin
21 six (6) weeks of acceptance of project by owner.

22 3.07 TESTING

- 23 A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using level IIe
24 or higher field testers.
- 25 B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded,
26 and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper
27 termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
- 28 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.1 requirements.

29 **Category 6 Test Parameters:**

30

31

Frequency Mhz	TIA/EIA	TIA/EIA	Category 6 Cable		TIA/EIA	TIA/EIA
	568B.2-1	568B.2-1	Permanent Link Test		568B.2-1	568B.2-1
	Insertion Loss	NEXT	PSNEXT	ELFEXT	PSELFEXT	Return Loss
Attenuation	Worst Pair to	Worst Case	Worst Pair to	Loss	Loss	
Max. dB	Pair	Loss	Pair Loss	dB	dB	dB
	dB	dB	dB	DB	dB	dB
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	31.1	35.3	32.7	16.2	13.2	10.0

32

- 1 C. Propagation Delay
- 2 1. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2 for a
3 Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In
4 determining the permanent link propagation delay, the propagation delay contribution of
5 connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 250MHz).
- 6 D. Delay Skew
- 7 1. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall not
8 exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the propagation
9 delay skew between all pairs shall not vary more than +/- 10ns from the measured value at 20
10 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be determined
11 using a minimum 100m of cable.
- 12 E. In order to establish testing baselines, cable samples of known length and of the cable type and lot
13 installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-
14 pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be
15 calculated based on this test and be utilized during the testing of the installed cable plant. This
16 requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type
17 under test.
- 18 F. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement
19 and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective
20 material, equipment or installation method, and shall make additional tests as the Engineer deems
21 necessary at no additional expense to the project or user agency.
- 22 G. Where any portion of system does not meet the specifications, correct deviation and repeat applicable
23 testing at no additional cost to the owner.
- 24 3.08 FIELD QUALITY CONTROL
- 25 A. Employ job superintendent or project manager during the course of the installation to provide
26 coordination of work of this specification and of other trades, and provide technical information when
27 requested by other trades. This person shall maintain current RCDD® (Registered Communications
28 Distribution Designer) registration and shall be responsible for quality control during installation,
29 equipment set-up, and testing.
- 30 B. At least 30 percent of installation personnel shall be BICSI Registered Telecommunications Installers.
31 Of that number, at least 15 percent shall be registered at the Technician Level, at least 40 percent shall be
32 registered at the Installer Level 2, and the balance shall be registered at the Installer Level 1.
- 33 C. Installation personnel shall meet manufacturer’s training and education requirements for implementation
34 of extended warranty program.

35
36 END OF SECTION 27 10 00
37

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The building (Dane County City-County Building) in Madison has a complete fire alarm system in place. This project will provide a renovated fire alarm system with new devices in the area of remodeling only. The areas outside the scope of work shall remain as is.
- B. The original fire alarm system within the City-County Building was a Simplex 2120 fire alarm control panel that was installed in the early 1980's.
- C. Under a project completed in 2007, the fire alarm control panel was upgraded to be a SimplexGrinnell 4100U fire alarm control panel. All new fire alarm devices shall be intelligent, addressable devices that are compatible with the 4100U fire alarm control panel currently installed.
- D. The contractor shall be aware the building does meet the definition of high-rise construction and all fire alarm devices shall contain the ability for digital voice communications. Therefore, speaker/strobe devices will be used instead of horn/strobe devices. Provide any necessary power extender (NAC) panels for the visual notification devices as required.
- E. Provide wiring as required to incorporate these new devices into the existing SimplexGrinnell 4100U fire alarm control panel. Coordinate this work with the Madison sales office of SimplexGrinnell.
- F. The Contractor shall be aware that most of the building will remain occupied during construction of this remodeled area.
 - 1. The Contractor shall be responsible for turning off/turning on the fire alarm system to allow for work to be performed. Also, the Contractor shall be responsible for contacting Dane County building maintenance staff at any time when the fire alarm system is down. This will allow for an announcement to be made to all building occupants.
 - 2. All testing shall be done during non-occupied hours.
 - 3. Extreme care should be taken on the part of the Contractor to reduce or eliminate nuisance tripping of the fire alarm smoke detectors during construction. Extensive nuisance tripping of the fire alarm system cannot be tolerated due to the high volume of occupants in the building.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA No. 70 - National Electric Code (NEC).
 - b. NFPA No. 101 - Life Safety Code.
 - 2. Wisconsin Enrolled Building Commercial Building Code.
 - 3. Underwriters Laboratories, Inc.
 - 4. Local codes and ordinances.
- B. Reference Standards:
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA No. 72
 - 2. National Electrical Manufacturer's Association (NEMA).

- 1 C. System equipment to be of one manufacturer and supported by factory trained, established service
2 organization of equipment manufacturer who shall stock parts for equipment supplied.
- 3 D. Equipment must be manufactured by firm actively manufacturing fire alarm systems for minimum of 10
4 years.
- 5 E. Manufacturer's Services:
- 6 1. Manufacturer's representative factory trained service engineer for equipment specified herein shall
7 be present at job site to supervise final adjustment of system after installation complete, equipment
8 startup, and training of OWNER'S personnel for system operation.
- 9 2. Manufacturer shall direct services to system and equipment operation, maintenance,
10 troubleshooting, and equipment and system related areas.

11 1.03 SUBMITTALS

- 12 A. Shop Drawings to include:
- 13 1. Data sheets and equipment description.
- 14 2. Bill of materials listing components.
- 15 3. Component wiring diagrams.
- 16 4. System wiring and interconnection diagrams showing all devices – not a typical diagram.
- 17 B. Operation and Maintenance (O & M) Data: Submit in accordance with Section 01 00 00.
- 18 C. Field quality control test results.

19 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- 20 A. Receive equipment at job site, verify applicable components and quantity delivered per invoice.
- 21 B. Handle equipment to prevent internal components damage, breakage, denting, and scoring enclosure and
22 finish.
- 23 C. Do not install damaged equipment.
- 24 D. Store equipment in clean, dry space and protect from dirt, fumes, water, construction debris, and physical
25 damage.
- 26 E. After installation, protect from damage by Work of other trades.

27 PART 2 - PRODUCTS

28 2.01 GENERAL

- 29 A. Use of manufacturer's name and model or catalog number is for purpose of establishing standard of
30 quality, general configuration, and operating characteristics desired only.

31 2.02 ACCEPTABLE MANUFACTURERS

- 32 A. SimplexGrinnell
- 33 B. Due to the existence of the existing SimplexGrinnell fire alarm control panel, no other manufacturers will
34 be accepted.

35 2.03 SYSTEM OPERATION

1 A. The system operation for the existing SimplexGrinnell 4100U fire alarm control panel shall remain as is
2 with no modifications.

3 2.04 FIRE ALARM CONTROL PANEL

4 A. The fire alarm control panel is an existing SimplexGrinnell 4100U addressable FACP. This equipment
5 will remain in place and the fire alarm system shall be extended to the areas of remodeling with
6 compatibility with this fire alarm control panel.

7 2.05 SMOKE DETECTION

8 A. Smoke detectors shall be Photoelectric type, SimplexGrinnell True Alarm Analog Sensing 4098 series.

- 9 1. Analog addressable.
- 10 2. Light scattering principle.
- 11 3. UL magnet test feature.
- 12 4. Remote test by control panel command.
- 13 5. Dual alarm and power LED.
- 14 6. Adjustable sensitivity via panel command.
- 15 7. Mounts on 4" octagon or 4" square box with square to round ring.

16 B. Duct smoke detector shall be SimplexGrinnell addressable True Alarm Photoelectric Sensor 4098-9755.

- 17 1. Analog addressable.
- 18 2. For air velocity between 300 and 4000 feet per minute.
- 19 3. Sampling tube as required for duct width dimensions.

20 C. Isolation module:

- 21 1. Automatically isolate wire-to-wire short circuit from SLC loop.
- 22 2. Provide one for each 20 addressable/intelligent devices.
- 23 3. Amber LED shall flash to indicate activation.
- 24 4. Mount on 4 inch square or 4 inch square box with 2 gang ring.

25 2.06 HEAT DETECTION

26 A. Heat detector shall be SimplexGrinnell E-Series Electronic Heat Detector 4098 series

- 27 1. Analog addressable fixed plus rate of rise.
- 28 2. Dual thermistors.
- 29 3. Self restoring.
- 30 4. Mount on 4" octagon or 4" square box with square to round ring.

31 2.07 MODULES:

32 A. Monitor module

- 33 1. Monitor contact closing devices (Class B).
- 34 2. Addressable.
- 35 3. Mounts on 4" square or 4" square with 2 gang ring.

36

- 1 B. Control module
- 2 1. Addressable.
- 3 2. DPDT relay contact rated at 3.0A, 30VDC, 0.5A 110VAC.
- 4 3. Mount on 4" square or 4" square with 2 gang ring.
- 5 4. Must be located with 3' of device being controlled.
- 6 C. Isolation module
- 7 1. Automatically isolate wire-to-wire short circuit from SLC loop.
- 8 2. Provide one for each 20 addressable/intelligent devices (Maximum of 25 devices per module).
- 9 3. Amber LED shall flash to indicate activation.
- 10 4. Mount on 4" square or 4" square with 2 gang ring.
- 11 2.08 PULL STATIONS
- 12 A. Pull station shall be a SimplexGrinnell 4099-9003
- 13 1. Double action, Push operation, English
- 14 2. Addressable.
- 15 3. Lexan construction.
- 16 4. Key reset.
- 17 5. Within ADA 5lb. pull force.
- 18 6. Includes Braille text on station handle.
- 19 7. Bi-color LED visible through handle of station.
- 20 8. Mount on 4" square with 1 gang ring.
- 21 2.09 NOTIFICATION DEVICES - SIGNALS
- 22 A. Speaker/Strobe voice evacuation unit shall be Wheelock Series ET70 addressable speaker/visual
- 23 notification devices.
- 24 1. Speaker
- 25 a. High quality voice or tone reproduction with tamps for 1/4, 1/2 , 1 or 2 watts at 25 or
- 26 70.7 VRMS.
- 27 2. Strobe
- 28 a. 15/75cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela
- 29 requirements).
- 30 3. Mounts on 4" square or 4" square with 1- or 2-gang ring.
- 31 4. All devices shall be wall-mounted wherever possible. However, where required due to existing
- 32 conditions, ceiling mounted speaker/strobe devices shall be allowed to be used.
- 33 B. Strobe unit shall be Wheelock Series RSS visual notification devices mounted to RSSP plates.
- 34 1. 15/75cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela requirements).
- 35 2. Mounts on 4" square box or 4" square with 1- or 2-gang ring.
- 36 C. All notification devices shall be white.
- 37
- 38 2.10 NOTIFICATION APPLIANCE CIRCUIT PANEL
- 39 A. Notification Appliance Circuit Panel (NAC) shall be SimplexGrinnell 4009 Series
- 40

- 1 1. Provides four, power-limited NACs with general alarm operation, available as Class B or Class A,
2 each rated 2 A (expandable to eight NACs)
- 3 a. Includes 8 A power supply/charger
4 b. Follows coded or non-coded alarm input
- 5 2.11 MAGNETIC DOOR HOLDERS
- 6 A. Door holder shall be LCN 404SE (Furnished and installed by General Contractor):
- 7 1. Closer holder combination
8 2. 24V DC solenoid
- 9 2.12 FLOW, PRESSURE AND TAMPER SWITCHES
- 10 A. Wire and install in accordance with requirements of other specification sections and wire as specified in
11 this section. Provide necessary monitor modules and circuits. Wire and install outdoor sprinkler alarm
12 bell. Flow, pressure, tamper switches and sprinkler alarm bell furnished by others.
- 13 2.13 SLAVE FAN RELAY
- 14 A. Slave fan relay shall be SimplexGrinnell model 4090-9002 Relay IAM.
- 15 PART 3 - EXECUTION
- 16 3.01 INSPECTION
- 17 A. Examine areas and conditions under which fire alarm system to be installed and notify ENGINEER in
18 writing of conditions detrimental to proper and timely completion of Work.
- 19 3.02 INSTALLATION
- 20 A. Installation of the Fire Alarm/Life Safety System shall be in strict compliance with manufacturer's
21 recommendations. Consult the manufacturer's Control Panel and Peripheral Equipment installation
22 manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system
23 installation.
- 24 B. Power Requirements:
- 25 1. The Fire Alarm Control Panel (FACP) and/or Notification Appliance Circuit (NAC) panels shall
26 be connected to a separate 20 ampere, 120 volt dedicated branch circuit labeled as FIRE ALARM.
- 27 2. The Control Panel Cabinet shall be grounded securely using a copper grounding conductor.
- 28 3. Conduit shall enter into the Fire Alarm Control panel backbox only at those areas of the back box
29 which have factory conduit knockouts.
- 30 4. All field wiring shall be completely supervised. In the event of a primary power failure,
31 disconnected standby battery, removal of any internal modules, or any open circuits in the field
32 wiring; an audible and visual trouble signal will be activated until system and its associated field
33 wiring are restored to normal condition.
- 34 C. Cables must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed
35 in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
- 36 D. SLC loops shall be loaded to no more than 75% of their capacity.
37

- 1 E. Install wiring in accordance with Section 26 05 00 and shall be in accordance with the NEC, NFPA 72,
2 local and state codes, as shown on the drawings, and as recommended by the major equipment
3 manufacturer. See Article 3.06 FREE AIR CABLING for further requirements.
- 4 1. SLC loop shall be 2 #16 shielded FPLR or FPLP cable as required.
5 2. Signal circuit wiring shall be 2 conductor #14 or 2 conductor #12 FPLR or FPLP cable as
6 required. 2#14 or 2#12 THHN is acceptable if signal circuits are enclosed in listed raceway.
7 Synchronization modules shall be utilized to provide audio and visual synchronization over 2
8 conductors. Consult loading chart for proper wire gauge and wire length to insure against
9 excessive DC voltage drop. A minimum of 20.5V DC must be available at the last signal of a
10 NAC under full alarm condition.
- 11 3. Provide 2 #14 from control panel or door holder power supply to door holders.
- 12 F. Provide all fire alarm system wiring drops to devices within raceways and junction boxes. Where
13 existing conditions prohibit fishing existing walls, so as to avoid excessive cutting and restoration
14 metallic wiremold finished to match existing wall surface shall be permitted where allowed by
15 OWNER/ENGINEER, routing subject to OWNER/ENGINEER approval. Install conduit in accordance
16 with Section 26 05 00 and as shown on Drawings.
- 17 G. All fire detection and alarm system devices, control panels and remote annunciators shall be flush
18 mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- 19 H. Smoke detectors shall not be installed prior to the system programming and test period. If construction is
20 ongoing during this period, measures shall be taken to protect smoke detectors from contamination and
21 physical damage. Ref: NFPA 72.
- 22 I. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may
23 be exposed in unfinished areas if approved by Owner/Engineer before installation. All system junction
24 boxes shall be as manufactured by system supplier or painted red and stenciled with fire alarm system
25 designation.
- 26 J. All fire detection and alarm system devices shall be flush mounted when located in finished areas and
27 may be surface mounted when located in unfinished areas if approved by Owner/Engineer before
28 installation.
- 29 K. All conductor identification shall be labeled in accordance with Section 26 05 00 at all accessible
30 locations including at control panel, junction boxes and at devices for future tracing and maintenance.
- 31 L. Provide concealed 3/4" conduit and wire to telephone terminal board from main fire alarm control panel.
- 32 M. Coordinate connections with supplier of central station network system.
- 33 N. Provide concealed 3/4" conduit and wire to security panel for monitoring of trouble, supervisory and
34 system alarm.
- 35 O. Provide elevator recall and elevator shunt trip using addressable control modules. Utilizing detector
36 auxiliary contacts is not acceptable and violates NFPA 72. Provide Elevator shunt trip power supervision
37 for integrity per NFPA 72.
- 38 3.03 ADJUSTMENT AND CLEANING
- 39 A. Clean system equipment and enclosure of dirt and debris.
40

- 1 3.04 FIELD QUALITY CONTROL
- 2 A. Provide the service of a NICET certified, Level II minimum, factory-trained technician authorized by the
3 manufacturer of the fire alarm equipment to technically supervise and participate during all of the
4 adjustments and test for the system.
- 5 B. System shall test free from grounds, opens, and short circuits.
- 6 C. Upon completion of installation of fire alarm equipment, CONTRACTOR shall provide ENGINEER
7 with signed written statement substantially in form as follows.
- 8 D. "The undersigned having been engaged as the CONTRACTOR on the "DANE COUNTY CITY-
9 COUNTY BUILDING" confirms the fire alarm equipment was installed in accordance with wiring
10 diagrams, instructions, and directions provided to us by the manufacturer."

11 3.05 WARRANTY

- 12 A. All work performed and all material and equipment furnished under this contract shall be from defects
13 and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of
14 maintenance, labor and materials required to correct any defect during this one year period shall be
15 included in the submittal bid.

16 3.06 FREE AIR WIRING

- 17 A. All wiring shall be run "free-air", in conduit or in surface raceway. "Free-air" wiring is allowed where it
18 can be completely concealed. If wiring cannot be concealed, it shall be installed in wiremold in finished
19 areas and in conduit in unfinished areas.
- 20 B. Where installed "free-air", comply with the following:
- 21 1. Cable shall run at right angles and be kept clear of other trades work.
- 22 2. Cables shall be supported according to code utilizing bridle rings anchored to ceiling concrete,
23 piping supports or structural steel beams. Rings shall be designed to maintain cables bend to
24 larger than the minimum bend radius (typically 4 x cable diameter).
- 25 3. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If
26 cable "sag" at mid-span exceeds 12-inches, another support shall be used.
- 27 4. Cable shall never be laid directly on the ceiling grid.
- 28 5. Cables shall not be attached to or supported by, existing cabling, plumbing or steam piping,
29 ductwork, ceiling supports or electrical or communications conduit.
- 30 6. A coil of 2 feet in each cable shall be placed in the ceiling at each "free-air" wired fire alarm
31 device. These "service loops" shall be secured at the last cable support before the cable reaches the
32 device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
- 33 7. Devices wired with conduit shall be provided with an 8-inch wire tail at each device box and 36-
34 inch wire tails at the FACP and FAAP.
- 35 8. To reduce or eliminate EMI, the following minimum separation distances from $\leq 480V$ Power lines
36 shall be adhered to:
- 37 a. Twelve (12) inches from power lines of <5 -kVa.
- 38 b. Eighteen (18) inches from high voltage lighting (including fluorescent).
- 39 c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
- 40 d. Thirty-nine (39) inches from transformers and motors.
- 41 9. All cable shall be free of tension at both ends. In cases where the cable must bear some stress,
42 Kellem grips shall be used to spread the strain over a longer length of cable.
- 43

