

RFB NO. 320009



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. 320009
LOCKER ROOM REMODEL
ALLIANT ENERGY CENTER COLISEUM (TEAM ROOMS 1-4)
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN**

Due Date / Time: **TUESDAY, MARCH 24, 2020 / 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:

J. Eric Urtes, AIA, Project Manager
Telephone No.: 608/266-4798
FAX NO.: 608/267-1533
E-mail: urtes.eric@countyofdane.com

SECTION 00 01 10

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LEGAL NOTICE

INVITATION TO BID

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, MARCH 24, 2020

RFB NO. 320009

LOCKER ROOM REMODEL

ALLIANT ENERGY CENTER COLISEUM (TEAM ROOMS 1-4)

1919 ALLIANT ENERGY CENTER WAY, MADISON, WI

Dane County is inviting Bids for construction services to remodel four locker rooms. 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 March 3, 2020** by downloading it from bids-pwht.countyofdane.com. Please call Eric Urtes, AIA – Public Works Project Mgr., at 608/266-4798 (urtes.eric@countyofdane.com), or our office at 608/266-4018, for any questions or additional information.

All Bidders must be qualified as, or apply to be a Best Value Contractor before Bid Due Date. Complete Pre-qualification Application for Contractors at pwht.countyofdane.com/bvc_application.aspx or obtain one by calling 608/267-0119.

A pre-bid facility tour will be held March 12, 2020 at 10:00 a.m. at the Alliant Energy Center Coliseum starting at the northside loading docks entrance. Bidders are strongly encouraged to attend this tour.

PUBLISH: MARCH 3 & MARCH 10, 2020 - WISCONSIN STATE JOURNAL
MARCH 3 & MARCH 10, 2020 - THE DAILY REPORTER

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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 March 12, 2020 at 10:00 a.m. at the Alliant Energy Center Coliseum, 1919 Alliant Energy Center Way, Madison, WI. Attendance by all bidders is optional, however bidders and subcontractors are strongly encouraged to attend.
- D. 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. Has record of satisfactorily completing past projects and supplies list of no more than three (3) most recent, similar projects, with architect or engineer's and owner's names, addresses and telephone numbers for each project. Submit to Public Works Project Manager with Bid. 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 provision, 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 this ESB listing: pdf.countyofdane.com/commissions/2013-2015_Targeted_Business_Directory.pdf.
- G. **ESB Certification.** All contractors, subcontractors and suppliers seeking ESB certification must complete and submit Emerging Small Business Report to Dane County Contract Compliance Program.
- H. **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.

I. **Questions.** Questions concerning Emerging Small Business provisions shall be directed to:

Dane County Contract Compliance Specialist
City-County Building, Room 356
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
608/266-4192

J. **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.

K. **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.

L. **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. 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. Bids received after time of closing will be rejected and returned to bidder unopened.
- H. Bid will be considered invalid and will be rejected if bidder has not signed it.
- I. Faxed or emailed Bids will not be accepted.
- J. Bidder's organization shall submit completed with Bid, Fair Labor Practices Certification form, included in these Construction Documents.

14. SUBCONTRACTOR LISTING

- A. Bidders shall be required to submit list of major subcontractors for General Construction, Plumbing, HVAC, and Electrical work proposed for this project to include committed prices for each subcontractor. List shall be placed in separate sealed envelope that must be clearly identified as "Major Subcontractor List", for named project and name of Bidder submitting it. County must receive envelope no later than date by which successful Bidder is required to submit his or her signed Contract, as established in Construction Documents.

15. ALTERNATE BIDS

- A. Not Applicable.

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.

19. WORK BY OWNER

- A. Not Applicable.

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
EMERGING SMALL BUSINESS REPORT - CONTACTS**

(Copy this Form as necessary to provide complete information)

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. 320009

**PROJECT: LOCKER ROOM REMODEL
ALLIANT ENERGY CENTER COLISEUM (TEAM ROOMS 1-4)**

**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 four locker rooms at the Alliant Energy Center Coliseum. 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 _____

Alliant Energy Center must have this project completed by July 24, 2020. Assuming this Work can be started by May 5, 2020, 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 agrees to be qualified as a Best Value Contractor or will prove their exemption. New or updated applications are due on or before Bid Due Date / Time; qualification or rejection will be complete within five (5) business days after Bid Due Date.

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 24 months. Complete a *Best Value Contracting Application* online at:

pwht.countyofdane.com/bvc_application.aspx

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?

COUNTY OF DANE

PUBLIC WORKS CONSTRUCTION CONTRACT

Contract No. _____ Bid No. 320009

Authority: 2019 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 Locker Room Remodel at the Alliant Energy Center Coliseum (Team Rooms 1-4) ("the Project"); and

WHEREAS, CONTRACTOR, whose address is _____ is able and willing to construct the Project, in accordance with the Construction Documents, Scope of Work document, site meeting, etc.;

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 (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 and subcontractors must be qualified as, or apply to be a Best Value Contractor with Dane County Public Works Engineering Division before Bid Due Date. All contractors must be qualified as a Best Value Contractor 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)

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: _____

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

Signature: _____

Name _____
and Title: _____

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

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.

§ 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.

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. See Wisconsin Statute 77.54 (9m).
- 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. Submit Equal Benefits Compliance Payment Certification with final pay request. Payment may be denied if Certification is not included.
- 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 ten (10) or more employees and receives \$10,000.00 or more in annual aggregate contracts with County. Contractor shall file and Affirmative Action Plan with Dane County Contract Compliance Officer 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 Contract Compliance Office, 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 Officer at Dane County Contract Compliance Office, 210 Martin Luther King, Jr. Blvd., Room 421, Madison, WI 53703, 608/266-4114.
 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 Officer 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 Officer, 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 Officer 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 Officer 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. DOMESTIC PARTNERSHIP BENEFITS

- A. Not Used.

46. 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.

47. MINIMUM WAGES

- A. Contractor shall post, at appropriate conspicuous point on site of project, schedule showing all determined minimum wage rates for various classes of laborers and mechanics to be engaged in the Work under this Contract and all deductions, if any, required by law to be made from unpaid wages actually earned by laborers and mechanics so engaged.
- B. Supplementary Conditions section in Construction Documents lists wage determinations required by State Law.
- C. If, after award of Contract, it becomes necessary to employ any person in trade or occupation not classified in wage determinations, such person shall be paid at not less than such rate as shall be determined by Wisconsin Department of Workforce Development. Such approved minimum rate shall be retroactive to time of initial employment of such person in such trade or occupation. Contractor shall notify Department of Contractor's intention to employ persons in trades or occupations not so classified in sufficient time for Department to obtain approved rates for such trades or occupations.
- D. Specified wage rates are minimum rates only, and Department will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of applicable rate contained in this Contract. Contractor shall adjust any disputes in regard to payment of wages in excess of those specified in this Contract.

48. 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.

49. 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.

50. 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.

51. 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 Public Works Project Manager 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.

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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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				
<p>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.</p> <p>AIA Document G703™ – 1992. Copyright © 1963, 1965, 1966, 1967, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.</p>								
<p>10-1204504</p>								

END OF SECTION



Department of Public Works, Highway & Transportation
Public Works Engineering Division

608/266-4018

Gerald J. Mandli, P.E.
Commissioner / Director

Joseph T. Parisi
County Executive

Deputy Director
Todd Draper

1919 Alliant Energy Center Way
Madison, Wisconsin 53713
Fax: 608/267-1533
www.countyofdane.com/pwht/public_works.aspx

BEST VALUE CONTRACTING APPLICATION

CONTRACTORS / LICENSURE APPLICANTS

The Dane County Department of Public Works requires all contractors & subcontractors to be a best value contractor before being hired. Application documents are due to the County prior to Bid Due Date. Approval or rejection shall be within five (5) days of Bid Due Date. 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 two (2) 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. 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/>.

EXEMPTIONS

- Contractors who employ less than five (5) apprenticeable trade workers are not required to qualify.
- Contractors performing work that does not apply to an apprenticeable trade, as outlined in Appendix A.
- The contractor / subcontractor provides sufficient documentation to demonstrate one or more of the following:
 - apprentices are not available in a specific geographic area;
 - the applicable apprenticeship program is unsuitable or unavailable; or
 - there is a documented depression of the local construction market which prevents compliance.

SEC.	PROOF OF RESPONSIBILITY	CHECK IF APPLICABLE
1	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"/>
2	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"/>
3	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
4	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"/>
5	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"/>
6	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"/>
7	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.
8	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.
9	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.
10	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.
11	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.
12	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.
13	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"/>
14	Is your firm exempt from being qualified with Dane County?	Yes: <input type="checkbox"/> No: <input type="checkbox"/> If Yes, attach reason for exemption.
15	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 within five (5) days after the Bid Due Date?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
16	Contractor has been in business less than one year?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
17	Is your firm a first time Contractor requesting a one time exemption, but, intend to comply on all future contracts and are taking steps typical of a "good faith" effort?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>

SIGNATURE SECTION

Your firm's Officer, or the individual who would sign a bid and / or contract documents must sign this document.

I do hereby certify that all statements herein contained are true and correct to the best of my knowledge:

Signature: _____

(Application is invalid without signature)

Print Name: _____ Date: _____

Title: _____

NAME AND ADDRESS OF CONTRACTOR	
Name of Firm:	
Address:	
City, State, Zip:	
Phone Number:	
Fax Number:	
E-mail Address:	

REMEMBER!

RETURN ALL TO FORMS AND ATTACHMENTS, OR QUESTIONS TO:

**TODD DRAPER
EMAIL: DRAPER@COUNTYOFDANE.COM
OFFICE: (608) 267-0119, FAX: (608) 267-1533**

**DANE COUNTY DEPARTMENT OF PUBLIC WORKS, HIGHWAY & TRANSPORTATION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WI 53713**

APPENDIX A

APPRENTICEABLE TRADES:

- Bricklayer
- 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

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

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. Lump Sum Allowances for Work
 8. Coordination
 9. Cutting and Patching
 10. Conferences
 11. Progress Meetings
 12. Job Site Administration
 13. Submittal Procedures
 14. Proposed Products List
 15. Shop Drawings
 16. Product Data
 17. Samples
 18. Manufacturers' Instructions
 19. Manufacturers' Certificates
 20. Quality Assurance / Quality Control of Installation
 21. References
 22. Interior Enclosures
 23. Protection of Installed Work
 24. Parking
 25. Staging Areas
 26. Occupancy During Construction and Conduct of Work
 27. Protection
 28. Progress Cleaning
 29. Products
 30. Transportation, Handling, Storage and Protection
 31. Product Options
 32. Substitutions
 33. Starting Systems
 34. Demonstration and Instructions
 35. Contract Closeout Procedures
 36. Final Cleaning
 37. Adjusting
 38. Operation and Maintenance Data
 39. Spare Parts and Maintenance Materials

40. 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 construction services to remodel four locker rooms at the Alliant Energy Center Coliseum.
- B. Work by Owner: Not applicable.
- 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 Contractors or Subcontractors and access by Owner.
- B. Coordinate utility outages and shutdowns with Owner.

1.4 APPLICATIONS FOR PAYMENT

- A. Submit one (1) original copies with “wet” signatures of each application on AIA G702™ and G703™ forms or approved contractors invoice form.
- 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 Public Works Project Manager for approval & processing 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: there are no alternates proposed for this project.

1.7 LUMP SUM ALLOWANCES FOR WORK

A. Not used

1.8 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. Public Works Project Manager may choose to photograph or videotape site or workers as the Work progresses.

1.9 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.

1.10 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.

1.11 PROGRESS MEETINGS

- A. Owner shall schedule and administer meetings throughout progress of the Work at minimum of one (1) per week.
- B. Attendance at progress meetings by General Contractor, subcontractors, or their authorized representative, is mandatory.
- C. 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.
- D. Day & time of progress meetings to be determined at pre-construction meeting.

1.12 JOB SITE ADMINISTRATION

- A. Contractor shall not change their project superintendent or project manager for duration of the Work without written permission of Public Works Project Manager.

1.13 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.

1.14 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.

1.15 SHOP DRAWINGS

- A. Submit number of copies that Contractor requires, plus three (3) copies that shall be retained by Public Works Project Manager.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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.

1.21 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.

1.22 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.

1.23 PROTECTION OF INSTALLED WORK

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

1.24 PARKING

- A. Arrange for temporary parking areas to accommodate construction personnel. Parking 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.

1.25 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.

1.26 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

- A. Owner reserves right at any time to dismiss from premises any Contractor or construction personnel that do not uphold requirements of this Section.
- B. 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.
- C. 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.

- D. 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.
- E. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.
- F. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this Contract is to be performed.
- G. 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.
- H. 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.
- I. Contractor is not responsible for providing & maintaining temporary toilet facilities.

1.27 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.
- C. Contractor shall provide and maintain guard lights at all barricades, railings, obstructions in streets, roads or sidewalks and at all trenches adjacent to public walks or roads.

1.28 PROGRESS CLEANING

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

1.29 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.

1.30 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.31 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.

1.32 SUBSTITUTIONS

- A. Public Works Project Manager shall consider requests for Substitutions only within fifteen (15) calendar days after date of Public Works Construction Contract.
- 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.

1.33 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.

1.34 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.

1.35 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.

1.36 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.

1.37 ADJUSTING

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

1.38 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.

1.39 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.

1.40 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 Public Works Project Manager 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 may 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 may be recycled at Dane County Construction & Demolition Recycling Facility:
 1. Wood.
 2. Wood Pallets.
 3. PVC Plastic (pipe, siding, etc.).
 4. Asphalt & Concrete.
 5. Bricks & Masonry.
 6. Vinyl Siding.
 7. Cardboard.
 8. Metal.
 9. Unpainted Gypsum Drywall.
 10. Shingles.
- B. These materials can be recycled elsewhere in Dane County area:
 1. Fluorescent Lamps.
 2. Foam Insulation & Packaging (extruded and expanded).
 3. Carpet Padding.
 4. Barrels & Drums.
- 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: _____
Asphalt & Concrete	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Bricks & Masonry	_____ cu. ft. _____ lbs.	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____
Vinyl Siding	_____ 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: _____
Glass	_____ cu. yds. _____ tons	____ Recycled ____ Reused ____ Landfilled ____ Other	Name: _____

WASTE MANAGEMENT PLAN FORM

Other	_____	<input type="checkbox"/> Recycled <input type="checkbox"/> Reused <input type="checkbox"/> Landfilled <input type="checkbox"/> Other	Name: _____
Other	_____	<input type="checkbox"/> Recycled <input type="checkbox"/> Reused <input type="checkbox"/> Landfilled <input type="checkbox"/> Other	Name: _____
Other	_____	<input type="checkbox"/> Recycled <input type="checkbox"/> Reused <input type="checkbox"/> Landfilled <input type="checkbox"/> Other	Name: _____
Other	_____	<input type="checkbox"/> Recycled <input type="checkbox"/> Reused <input type="checkbox"/> Landfilled <input type="checkbox"/> Other	Name: _____
Other	_____	<input type="checkbox"/> Recycled <input type="checkbox"/> Reused <input type="checkbox"/> Landfilled <input type="checkbox"/> Other	Name: _____

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

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

1.03 RELATED WORK

- A. 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

- A. Maintain record drawings showing actual locations of utilities and other features encountered, and any deviations from the original design. Show actual limits of removal and demolition.

1.08 SAFETY

- A. Verify that all gas and electrical utilities have been abandoned or disconnected and associated hazards mitigated, prior to beginning any demolition.
- B. Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other explosive or toxic fluids or gases. Purge lines and contain materials in accordance with all applicable regulations. Store such piping outdoors until fumes are removed.
- C. Maintain a clean and orderly site. Remove debris at end of each workday.
- D. If hazardous materials are not anticipated, but encountered, terminate operations and contact the Owner immediately. Follow all applicable local, state and federal regulations pertaining to hazardous materials.

1.09 PERMITS

- A. Unless otherwise noted, Contractor shall be responsible for obtaining and paying for all permits necessary to complete demolition work.
- B. If necessary, file and maintain Notification of Demolition and/or Renovation and Application for Permit Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter NR447.

1.010 DISCONNECTION OF SERVICES

- A. Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all existing utilities, communication systems, alarm systems and other services.
- B. Disconnect all services in manner which insures continued operation in facilities not scheduled for demolition.
- C. Disconnect all services in manner which allows for future connection to that service.
- D. Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.

1.011 REMOVAL/SALVAGING OF ITEMS

- A. Carefully remove all items that are scheduled to be salvaged.
- B. Secure salvaged items to allow for future movement; provide pallets, skids and other devices as necessary. Secure all loose parts.
- C. Provide crates, padding, tarps and other measures necessary to protect salvaged items during storage. Store items in secure location, safe from vandalism, weather, dust and other adverse elements.
- D. Where salvaged items are indicated to be turned over to Owner, deliver to location on property where designated by Owner.

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

PART 2 - PRODUCTS

2.01 EQUIPMENT

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

PART 3 - EXECUTION

3.01 GENERAL

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

3.02 PROTECTION OF EXISTING WORK AND FACILITIES

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

- 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 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

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SECTION 04 20 00
UNIT MASONRY

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PART 1 - GENERAL

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SCOPE

This section describes the products and execution requirements relating to furnishing and installation of Unit Masonry and related items for this project. Included are the following topics:

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56
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60
61

PART 1 - GENERAL

- Scope
- Related Work
- Reference Standards
- Related Material Furnished and Installed by Other Sections
- Submittals
- Coordination
- Quality Assurance
- Delivery, Storage and Handling
- Project/Site Conditions

PART 2 - PRODUCTS

- Masonry Units, General
- Concrete Masonry Units
- Mortar And Grout Materials
- Continuous Masonry Joint Reinforcement
- Individual Ties and Anchors:
- Accessories
- Shelf Angles And Lintels
- Masonry Cleaners
- Mortar Mixes

PART 3 – EXECUTION

- Examination
- Preparation
- Installation, General
- Tolerances
- Laying Masonry Wythe
- Mortar Bedding and Jointing
- Masonry Joint Reinforcement
- Movement Joints
- Shelf Angles and Lintels
- Flashing
- Spray Applied Air and Vapor Barrier and Rigid Insulation
- Repairing and Pointing
- Laying, Protection and Cleaning
- Adjustment
- Masonry Waste Disposal

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.
Section 05 50 00– Metal Fabrications
Section 07 92 00 – Joint Sealants
Section 08 11 13 – Hollow Metal Doors and Frames
Section 10 28 00 – Laundry and Bath Accessories

REFERENCE STANDARDS

Abbreviations of standards organizations referenced are as follows:
ACI American Concrete Institute
ASCE American Society of Civil Engineers
ASTM American Society for Testing and Materials
TMS The Masonry Society

1
2 **SUBMITTALS**

3 Shop Drawings: Submit shop drawings in coordination with 05 50 00 metal fabrications.
4

5 Product Data: Submit manufacturer's product data for each type of masonry unit, accessory and other
6 manufactured products.
7

8 As-Built Operations and Maintenance Masonry Manual: A binder with the listing of all materials utilized in
9 the masonry work including source, brands, type, and/or manufacturer's literature as appropriate for potential
10 future maintenance, shall be turned over to the Owner upon Substantial Completion of the masonry work.
11

12 **COORDINATION**

13 Examine all parts of the supporting structure and the conditions under which the masonry work is to be
14 installed and notify the Contractor in writing of any conditions detrimental to the proper and timely
15 completion of the work. Do not proceed with the installation of masonry work until unsatisfactory conditions
16 have been corrected in a manner acceptable to this Section contractor.
17

18 Review installation procedures of other work by Subcontractors whose work must be coordinated with the
19 masonry work.
20

21 The Contractor shall coordinate all work.
22

23 Consult with all Subcontractors and material suppliers whose involvement will be affected by the work of
24 this Section.
25

26 **QUALITY ASSURANCE**

27 Source Limitations for Masonry Units and Mortar Materials: One source from a single manufacturer for
28 each product utilized.
29

30 Preinstallation Conference: Conduct conference at Project before commencing masonry work.
31

32 **DELIVERY, STORAGE AND HANDLING**

33 Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location,
34 cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install
35 until they are dry.
36

37 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use
38 cementitious materials that have become damp or contaminated.
39

40 Store aggregates where grading and other required characteristics can be maintained and contamination
41 avoided.
42

43 Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into
44 dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover,
45 and in a dry location or in a metal dispensing silo with weatherproof cover.
46

47 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
48

49 **PROJECT/SITE CONDITIONS**

50 Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof
51 sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
52 Extend cover a minimum of 24 inches down both sides and hold cover securely in place. Since the concrete
53 masonry back-up wythe is required to be completed in advance of the face masonry wythe, secure cover a
54 minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
55

56 Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed.
57 Immediately remove grout, mortar, and soil that come in contact with such masonry. Protect base of walls
58 from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
59 Protect sills, ledges, and projections from mortar droppings. Protect surfaces of window and door frames,
60 including similar products with painted and integral finishes, from mortar droppings. Use cant strips or
61 similar devices on the scaffold boards against the wall to prevent mortar spattering off of the scaffold braces
62 or directly on the wall below. Turn scaffold boards near the wall on edge at the end of each day to prevent
63 rain from splashing mortar and dirt onto completed masonry.
64

1 Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do
2 not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.
3 Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
4

5 Hot-Weather Requirements: Comply with hot-weather construction requirements contained in
6 TMS 602/ACI 530.1/ASCE 6.
7

8 9 **PART 2 - PRODUCTS**

10 11 **MASONRY UNITS, GENERAL**

12 Provide special shapes or sizes as indicated on the Drawings or where cutting of units would expose the cut
13 in the completed work.
14

15 Referenced masonry unit standards allow a certain percentage of units to exceed tolerances and to contain
16 chips, cracks or other imperfections exceeding limits stated in the standard. Do not use units where such
17 imperfections, including tolerances that vary more than the amount stated in the standard, will be exposed in
18 the completed Work.
19

20 **CONCRETE MASONRY UNITS**

21 Materials and Physical Properties: Concrete block units shall be made from materials and manufactured to
22 comply with all applicable requirements of ASTM C90, Solid Units of Normal Weight, typically cored. No
23 integral water repellent is permitted.
24

25 Concrete masonry units shall be made from materials and manufactured to comply with all applicable
26 requirements of ASTM C55, Normal Weight, cored or uncored to be used with concrete block units as infill.
27

28 Source: All units shall be from one source and of uniform color and texture.
29

30 Size: Concrete block units shall be 7-5/8" x 15-5/8" x thickness indicated on Drawings. Concrete masonry
31 may be of size as appropriate to facilitate the work.
32

33 Special Shapes: Provide where required for lintels, corners, jambs, sash, movement joints, headers, bond
34 beams, and other special conditions specifically indicated including applications which cannot be produced
35 by cutting of standard size units.
36

37 Protection: Concrete masonry units shall be protected from the elements for a minimum time of seven days
38 immediately prior to being incorporated into the Work.
39
40

41 **MORTAR AND GROUT MATERIALS**

42 Portland Cement: Shall conform to ASTM C150, Type I. Only one brand and kind of Portland cement from
43 one source shall be used for the work unless prior written approval is obtained from the A/E. Brands are
44 subject to approval of the A/E based upon the mortar color desired and obtainable by use of the various
45 brands readily available. No white cement or nonstaining cement will be required.
46

47 Lime: Shall be pressure-hydrated, non air-entrained and conform to ASTM C207, Type S.
48

49 Masonry Sand: Shall be clean, sharp, free from loam, silt, vegetable matter, salts, and other injurious
50 substances, and shall conform to ASTM C144. Sand is further subject to approval of the A/E, based on
51 mortar color desired and obtainable by use of local sands readily available, and shall be from one source.
52

53 Aggregate for Grout: ASTM C404.
54

55 Water: Shall be potable, fresh, clean, clear, and free of injurious amounts of oil, acid, alkali, salts, organic
56 matter or other detrimental substances, and handled in clean containers.
57

58 Plasticizer: Not permitted.
59

60 Water Repellent: Not permitted.
61

62 Coloring Pigments: Not permitted.
63

64 Other Admixtures: Shall not be used at any time and will not be knowingly approved. Use of special air-
65 entraining admixtures, chlorides or nitrates, with or without approval, will be sufficient cause to require
66 removal and replacement of all masonry work containing or treated with same.
67

1 The autoclave expansion of the cementitious portion of the mortar materials, when mixed in proportions
2 required under "mortar mixes," shall not exceed one-half percent when tested according to ASTM C151.
3 The air content of any mortar required under "mortar mixes" shall not exceed six percent when tested
4 according to ASTM C231 and/or ASTM C173 and/or ASTM C457.
5

6 Fully or partial premixed mortar materials will be considered for approval when each requirement of the
7 individual materials is complied with and is so stated on the container, or certified, along with proportions
8 and quantities.
9

10 **CONTINUOUS MASONRY JOINT REINFORCEMENT**

11 Materials and Coatings: Use prefabricated electrically flush or butt welded wire units, truss type, not less
12 than 10-feet long, with matching corner units, fabricated from cold drawn steel wire complying with
13 ASTM A82. Provide galvanized (zinc coated) units conforming to Class B requirements of ASTM A153 in
14 all exterior walls and in interior corridors or partitions enclosing wet or high moisture areas. For other interior
15 walls, coating of wire units may conform to Class 3 requirements of ASTM A641.
16

17 Single Wythe Interior Concrete Masonry Corridors and Partitions: Use one side rod for each face shell of
18 concrete masonry units. All wire shall be 9 gauge. Units shall be equivalent to Hohmann & Barnard, Inc.
19 # 120.
20

21 **INDIVIDUAL TIES AND ANCHORS:**

22 Materials and Coatings: Provide galvanized (zinc coated) steel units conforming to Class B requirements of
23 ASTM A153, unless otherwise specified.
24

25 Juncture of Concrete Masonry Back-up with Concrete Columns: Provide corrugated dovetail tie 1" wide by
26 12 gauge by 5-1/2" long, fitted to 12 gauge dovetail anchor; equivalent to Hohmann & Barnard, Inc. # 303
27 corrugated dovetail brick tie with mill galvanized finish.
28

29 Attachment of Exterior Face Wythe Masonry Passing Over Concrete Columns: None required.
30

31 Attachment of Concrete Masonry Partitions to Concrete Masonry Back-up or Other Partitions: Provide
32 prefabricated T-shaped units or wire mesh tie 1/2" squares of 16 gauge; equivalent to Hohmann & Barnard,
33 Inc. MWT Mesh Wall Tie with hot galvanized finish.
34

35 **SHELF ANGLES AND LINTELS**

36 Coordinate with Section 05 12 00 contractor for metal materials and fabrication and drawing schedules and
37 details for size and locations.
38

39 Concrete masonry lintels may be prefabricated or built-in-place masonry lintels made from bond beam
40 concrete masonry units. Provide reinforcing bars of material specified in the Concrete Reinforcing Schedule
41 in accordance with drawing schedules and details. Fill lintel with ASTM C 476 Coarse Grout or concrete as
42 specified. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until
43 cured.
44

45 Concrete Reinforcing Schedule: Up to 4 FT, Wall: 4" and 6" CMU, Lintel: 8" Bond Beam with #4 cont.
46 grouted. Bear minimum 8" on grouted jambs with #4 vertical.
47

48 **MASONRY CLEANERS**

49 Not permitted.
50

51 **MORTAR MIXES**

52 Conventional Job Mixed Mortar: Measure materials for mortars by volume, in a manner whereby proportions
53 can be controlled within two percent. Mix materials dry and then water to bring to proper consistency for
54 use. Mix materials in the approved type machine mixer of adequate capacity for 3 to 5 minutes after all
55 materials have been introduced, until materials are evenly distributed throughout the batch and the mixture
56 is uniform in color with a workable consistency.
57

58 Silo Metered and Bulk Container Mortar: Shall comply with ASTM C1714. Use materials specified
59 hereinbefore and proportion mixes as specified hereinafter. Add water and mix according to system
60 manufacturer's recommendations.
61

62 Use maximum water consistent with good workability and freedom from smearing the face of masonry work.
63 Use no mortar that has stood more than one hour after initial mixing. Mortar less than one hour old shall be
64 reasonably retempered as necessary to maintain its workability, but used before it is one hour old or otherwise
65 discarded. No anti-freeze ingredient or contaminate of any type will be permitted.
66

1 Mortar Brick and Concrete Block: Shall be ASTM C270, Type N, Cement-Lime Mortar conforming to the
2 proportion specification requirements. (1:1:6).

3
4 The proportions listed above are Portland cement, lime, damp loose sand, respectively by volume. The
5 proportions are listed only as samples for the required type mortars and shall be modified as necessary, within
6 tolerances, to suit the particular masonry sand being used.

8 **PART 3 – EXECUTION**

11 **EXAMINATION**

12 Examine Work of other Section Contractors on which or to which unit masonry is to be built, supported or
13 attached, to determine completeness and proper alignment to receive unit masonry. Do not commence
14 masonry work until all related noncompliant work has been corrected.

15
16 Before installation of masonry, examine rough-in and built-in construction for piping systems to verify actual
17 locations of piping connections.

19 **PREPARATION**

20 Verify that items provided by other Section Contractors are properly sized and located.

21
22 Verify that anchorages embedded in concrete are properly placed.

23
24 Establish lines, levels, and coursing. Protect from disturbance.

25
26 Provide temporary bracing during erection of masonry work. Maintain in place until building structure
27 provides permanent bracing.

29 **INSTALLATION, GENERAL**

30 Build concrete masonry walls to actual width of masonry units using units of widths indicated.

31
32 Build chases and recesses to accommodate items specified in this and other Sections.

33
34 Leave openings for equipment to be installed before completing masonry. After equipment is installed,
35 complete masonry to match the construction immediately adjacent to opening.

36
37 Use full size units without cutting where possible. If cutting is required to provide a continuous pattern or to
38 fit adjacent construction, cut units with motor-driven saws to provide cuts that are straight and true, resulting
39 in clean, sharp unchipped edges of the units. Allow typical cut units to surface dry before laying. Install cut
40 units with cut surfaces and, where possible, cut edges concealed.

41
42 Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.

44 **TOLERANCES**

45 Dimensions and Locations of Elements: For dimensions in cross section or elevation do not vary by more
46 than minus 1/4 inch or plus 1/2 inch.

47
48 For location of elements in plan do not vary from that indicated by more than minus $\pm 1/2$ inch in 20 feet or
49 $\pm 3/4$ inch total.

50
51 For location of elements in elevation do not vary from that indicated by more than $\pm 1/4$ inch in a story height
52 or $\pm 3/4$ inch total.

53
54 Lines and Levels: For bed joints, do not vary from level by more than $\pm 1/4$ inch in 10 feet, or $\pm 1/2$ inch
55 maximum.

56
57 For horizontal lines, do not vary from level by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch
58 maximum.

59
60 For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet,
61 or 1/2 inch maximum. Total vertical alignment of exposed head joints may have double these tolerances.

62
63 For lines and surfaces, do not vary from straight or plane by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet,
64 or 1/2 inch maximum.

65
66 For faces of adjacent exposed masonry units, do not vary from flush alignment by more than $\pm 1/8$ inch.

1 Joints: For bed joints, do not vary from thickness indicated by more than $\pm 1/8$ inch.

2
3 For head and collar joints, do not vary from thickness indicated by more than minus $1/4$ inch or plus $3/8$ inch.

4
5 If the above tolerances cannot be met due to previous construction, notify the A/E.

6 7 **LAYING MASONRY WYTHES**

8 Lay out walls in advance for alignment of head joints with uniform joint thicknesses and for accurate location
9 of openings, movement joints, returns, and offsets. Maintain horizontal joint plane through all wythes of
10 masonry. Fully bond intersections, and external and internal corners. Avoid using less-than-half-size units,
11 particularly at corners, jambs, and, where possible, at other locations.

12
13 Bond Pattern for All Masonry: Lay masonry in $1/2$ running bond. Bond and interlock each course of each
14 wythe at corners. Do not use units with less than nominal 4 inch horizontal face dimensions at corners or
15 jambs.

16
17 Adjusting Units: Adjust the final position of each masonry unit while the mortar is still plastic. To replace
18 or reposition a unit after mortar has begun to set, remove the unit, replace the mortar with plastic mortar, and
19 replace the unit.

20
21 Tooling: Tool all mortar joints exposed in the finished work, including the bed joint directly above flashing.

22
23 Tool exposed joints when "thumb-print" hard with a round jointer, slightly larger than width of joint and of
24 sufficient length to obtain a straight and true mortar joint. Tooling shall be performed so that the mortar is
25 compressed and the joint surface is sealed and in intimate contact with the edge of the masonry unit. This
26 may require some craft persons to complete work after normal working hours. All crafts persons involved
27 in the project shall utilize new hardened steel jointers of the same size when beginning to lay masonry on the
28 project.

29
30 Where air and vapor barrier is to be applied to concrete masonry units, strike joint once, brush and leave joint
31 full, flush and free of voids.

32
33 Stopping and Resuming Work: Stop off horizontal run of masonry by racking back $1/2$ length of unit in each
34 course from those in course below. Do not tooth except where necessary around openings. When resuming
35 work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

36
37 Built-in Work: As construction progresses, build in items specified in this and other Sections. Include built-
38 in metal frames, anchor bolts, reglets, and other items to be built into the work supplied by other Section
39 Contractors. Bed anchors of hollow metal frames in mortar joints. Build in items plumb and level. Fill in
40 solidly with masonry around built-in items. Use ASTM C 476 grout or job mortar with high flow to slush
41 full voids between masonry and hollow metal door frames.

42
43 Cutting and Fitting: Cut and fit masonry units for chases, pipes, conduit, sleeves, ductwork, door and window
44 openings. Cooperate fully with other Contractors to ensure correct size, shape and location.

45
46 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire
47 mesh, or plastic mesh in the joint below and rod mortar or grout into the core.

48
49 Fill cores in concrete masonry units directly under lintels with mortar or grout.

50
51 Fill cores in concrete masonry units with mortar or grout above and below where portions of anchors are to
52 be installed.

53
54 Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure
55 above, with mortar joint at juncture.

56 57 **MORTAR BEDDING AND JOINTING**

58 For Face Brick: Lay units with filled bed and head joints. Butter ends with sufficient mortar to fill head
59 joints and set into place. Do not deeply furrow bed joints or slush head joints. Head and bed joints will be
60 considered full when the average joint solidity is 90 percent or greater, with no voids in that half of the joint
61 nearest the exterior face of the masonry.

62
63 For Concrete Masonry Units: Lay units with face shells fully bedded in mortar and with head joints of depth
64 equal to bed joints. For starting courses on concrete, lay units fully bedded in mortar, including areas under
65 cells.

66
67 Adhere expansion strips to jambs and head. Make certain expansion strip

1 extends to sill
2
3 Set a full mortar bed joint, applied to sill.
4
5 Maintain a uniform joint width of ¼ to ¾ inch plus or minus ⅛ inch.
6
7 Install panel reinforcing every 16" to 24" in the horizontal mortar joint and in joints immediately above and
8 below all openings within panels.
9 • Place lower half of mortar in bed joint. Do not furrow.
10 • Press panel reinforcing into place.
11 • Cover panel reinforcing with upper half of mortar bed and trowel smooth. Do not furrow.
12
13 Place full mortar bed for joints not requiring panel reinforcing - do not furrow. Maintain uniform joint width.
14
15 Set succeeding courses of block. Space at head of panel and jambs must remain free of mortar.
16
17 Strike joints smooth while mortars is still plastic and before final set.
18
19 After final mortar set (approx. 24 hrs.), install packing tightly between glass block panel and jamb and head
20 construction.
21
22 Apply sealant evenly to the full depth of recesses and in accordance with the manufacturer's application
23 manual and instructions.
24
25 Set architectural precast concrete units in full bed of mortar over flashing with full vertical joints.
26
27 Bed and head joints in masonry shall be of a nominal 3/8 inch thickness.
28
29 **MASONRY JOINT REINFORCEMENT**
30 Install entire length of longitudinal wire in mortar bed joints with a minimum cover of 3/4 inch on exterior
31 side of walls.
32
33 Do not bend typical continuous masonry joint reinforcement in the construction process.
34
35 Lap continuous masonry joint reinforcement ends a minimum of 6 inches.
36
37 Space continuous masonry joint reinforcement a minimum of 16 inches on center vertically.
38
39 Provide reinforcement no more than 8 inches above and below wall openings and extending 12 inches beyond
40 openings. Such reinforcement is in addition to continuous reinforcement when not coincident.
41
42 Interrupt joint reinforcement in a wythe wherever a movement joint occurs.
43
44 Provide continuity at concrete masonry wall intersections by using prefabricated T-shaped units or wire mesh
45 with cores filled.
46
47 Provide continuity at corners by using prefabricated L-shaped units.
48
49 **MOVEMENT JOINTS**
50 General: Install movement joints in unit masonry as work progresses.
51
52 Horizontal Movement Joints in Face Masonry Wythe: Provide horizontal pressure-relieving joints free of
53 mortar the full depth of face brick wythe and of size indicated, but not less than 1/4 inch for installation of
54 backer rod and sealant by Section 07 92 00 contractor. Movement joints shall be made free of all mortar as
55 work progresses and maintained free of mortar. No filler materials permitted.
56
57 Vertical Movement Joints in Concrete Masonry Wythes: Form movement joints with bond broken the full
58 depth of concrete masonry wythe and of width indicated, but not less than 3/8 inch for installation of backer
59 rod and sealant by Section 07 92 00 contractor. Use sash units and preformed gaskets, a continuous bond
60 break and grout or mortar, or special shaped units. Movement joints in the back-up concrete masonry wythe
61 typically occur at corners and at the juncture with concrete columns. See Drawings for location of movement
62 joints in interior concrete masonry corridors and partitions, typically above end of lintel at the door jambs
63 furthest away from the nearest vertical movement joint and at a maximum spacing of 25 feet. Interrupt
64 masonry joint reinforcing at movement joints. Mortar and bond breaker shall be raked back from the wall
65 surfaces sufficient to properly install backing and sealant.
66

1 **SHELF ANGLES AND LINTELS**

2
3 Install continuous shelf angles where indicated on the Drawings with angles and bolted connection hardware
4 supplied by Section 05 12 00 contractor into inserts in concrete spandrel beams or slab edges installed by
5 Section 03 30 00 contractor. Adjust angles as needed to keep the masonry level and at the proper elevation.
6 Where shims are required at attachment, they shall extend to the heel of the shelf angle to prevent rotation of
7 the angle. Shelf angles shall be mitered for building corners, typically prefabricated with each angle not
8 shorter than 4 feet, unless limited by wall configuration. Leave 1/8" to 1/4" space between ends of angles
9 when installing. In lieu of bolted connections, the Contractor may elect to use welded connections, except
10 joints in shelf angles shall then coincide with vertical movement joints in the face brick and a certified welder
11 shall be used.

12
13 Install loose steel lintels where indicated on the Drawings with angles supplied by Section 05 50 00
14 contractor. Provide minimum bearing of 4 inches at each jamb with lintel centered over opening. Provide
15 polyethylene bond breaker at the underside angle/top of masonry bearing surface.

16
17 Install concrete masonry lintels over doors, windows, and other substantial openings that occur in the concrete
18 masonry back-up wythe. Lintels may be precast or cast-in-place bond beams.

19
20 **REPAIRING AND POINTING**

21 Remove and replace to A/E's satisfaction masonry units that are loose, chipped, broken, stained, or otherwise
22 damaged or that do not match adjoining units as intended. Install new units to match adjoining units and
23 install in fresh mortar, pointed to eliminate evidence of replacement.

24
25 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with
26 mortar. Point up joints, including corners, openings, and adjacent work, to provide a neat, uniform
27 appearance. Prepare joints for sealant application, where indicated.

28
29 **LAYING, PROTECTION AND CLEANING**

30 All masonry shall be in final acceptance condition within 24 hours after laying and shall be maintained in
31 that condition, by meeting or exceeding the degree of cleanliness required, demonstrated on the approved
32 sample panel.

33
34 Lay masonry utilizing all necessary care to achieve cleanliness. Remove excess mortar from exposed exterior
35 and interior masonry surfaces as the work progresses and before it tenaciously adheres to the faces of the
36 masonry. Remove mortar protrusions and smears as masonry units are laid and tooled, as scaffolds are raised,
37 and at the start of the next day's work, leaving the surface of the masonry clean and finished. Use calcimine
38 brushes, stiff fiber brushes, other similar masonry units, burlap, rags, carpet remnants, rubber floats, or other
39 approved means. (Cleaning of masonry the morning after laying by the same masons who laid the masonry
40 the previous day, using stiff fiber brushes with or without water and sand, and concentrating on cleaning the
41 field of the masonry units has also been successfully used to achieve an appearance matching or exceeding
42 the cleanliness of the approved sample panel.) **Use of chemical cleaning or harsh physical cleaning will**
43 **not be permitted.** Included as chemical cleaners and prohibited are most manufactured masonry cleaning
44 solutions or compounds. Equipment or methods and techniques utilized, reduced productivity, as well as
45 weather conditions experienced will not relieve this Section contractor of required compliance.

46
47 Protection shall be provided to prevent mortar spattering and maintain masonry in a clean condition so that
48 the masonry is satisfactory for acceptance when masonry work is completed. This may require covering
49 portions of finished masonry which is below new work in progress with polyethylene, canvas, or other
50 approved means. Cover tops of unfinished walls and new work during inclement weather and at the end of
51 each day's work to prevent moisture entry. Extend covering a minimum of 24 inches down both sides of
52 wall, and hold covering securely in place. Hair-pin type devices frequently spaced have been successfully
53 used in the past. When practical, lay masonry from the top floor down.

54
55 No final washdown is required unless removal of earthy construction dirt or dust is necessitated by extremely
56 unusual site conditions.

57
58 If any masonry is not cleaned as required by these specifications, or if walls have an unsatisfactory appearance
59 upon completion of work, such violations will require additional work by this Section contractor for
60 producing acceptable masonry at no extra cost to the Owner. This is not to be construed as a Contractor's
61 option. Procedures must be submitted by this Section contractor and samples approved by all other parties
62 to the contract prior to proceeding with such work.

63
64 Upon completion of masonry work on exterior walls, inform Contractor so that covers on top of walls
65 installed by this Section contractor can be maintained until roofing and roof edge work has been completed.
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ADJUSTMENT

Should any Contractor use or attempt to use chemical cleaning utilizing acid or strong alkali based materials, or should any Contractor use or attempt to use harsh physical cleaning such as sand blasting or pressure water jetting; such actions will be construed as nonperformance causing the Owner damages which shall be liquidated by reducing payment to the Contractor in the amount of \$2.50 per square foot of masonry involved.

MASONRY WASTE DISPOSAL

Except for the extra stock of face masonry required to be turned over to the Owner, excess masonry materials are this Section contractor's property and shall be removed from the Project site upon completion of unit masonry work.

END OF SECTION

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Ceiling joist framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.

- B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
- 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

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1. Design Loads: Per code requirements.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
 - b. Ceiling Joist Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

16 C. Cold-Formed Steel Framing Design Standards:

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22
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.

23 D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with
24 AISI S100 and AISI S200.

25
26 2.2 COLD-FORMED STEEL FRAMING, GENERAL

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- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: ST33H.
 2. Coating: G60.

34 2.3 CEILING JOIST FRAMING

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- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.043".
 2. Flange Width: 1 3/8"

42 2.4 FRAMING ACCESSORIES

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- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.

8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- D. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

- 1 C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable
2 tolerance variation of 1/8 inch in 10 feet and as follows:
3
4 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location.
5 Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing
6 materials.
7 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square
8 tolerance of 1/8 inch.
9

10 PART 3 - EXECUTION

11 3.1 EXAMINATION

- 12 A. Examine supporting substrates and abutting structural framing for compliance with requirements for
13 installation tolerances and other conditions affecting performance of the Work.
14 B. Proceed with installation only after unsatisfactory conditions have been corrected.
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19 3.2 PREPARATION

20 3.3 INSTALLATION, GENERAL

- 21 A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
22
23 B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless
24 more stringent requirements are indicated.
25
26
27 C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
28
29 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-
30 line joints with maximum variation in plane and true position between fabricated panels not
31 exceeding 1/16 inch.
32
33 D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections
34 securely fastened.
35
36 1. Cut framing members by sawing or shearing; do not torch cut.
37 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or
38 riveting. Wire tying of framing members is not permitted.
39
40 a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and
41 quality of welds, and methods used in correcting welding work.
42 b. Locate mechanical fasteners and install according to Shop Drawings, and complying with
43 requirements for spacing, edge distances, and screw penetration.
44
45 E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension
46 members.
47
48 F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those
49 for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated
50 supporting structure has been completed and permanent connections to framing are secured.
51
52 G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of
53 joints.
54
55

- 1 H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members,
2 such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of
3 framing work.
4
- 5 I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard
6 punched openings.
7
- 8 J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum
9 allowable tolerance variation of 1/8 inch in 10 feet and as follows:
10
- 11 1. Space individual framing members no more than plus or minus 1/8 inch from plan location.
12 Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing
13 materials.
14

15 3.4 JOIST INSTALLATION

- 16
- 17 A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting
18 structure at corners, ends, and spacings indicated on Shop Drawings.
19
- 20 B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and
21 reinforce. Fasten joists to both flanges of joist track.
22
- 23 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
24 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip
25 angles, or steel-stud sections as indicated on Shop Drawings.
26
- 27 C. Space joists not more than 2 inches from abutting walls, and as follows:
28
- 29 D. Install joist reinforcement at interior supports with single, short length of joist section located directly over
30 interior support, with lapped joists of equal length to joist reinforcement, or as indicated.
31
- 32 1. Install web stiffeners to transfer axial loads of walls above.
33
- 34 E. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
35
- 36 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
37 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-
38 track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists
39 and secure solid blocking to joist webs.
40
- 41 F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
42
- 43 G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles,
44 continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing
45 assembly.
46

47 3.5 FIELD QUALITY CONTROL

- 48
- 49 A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests
50 and inspections and prepare test reports.
51
- 52 B. Field and shop welds will be subject to testing and inspecting.
53
- 54 C. Testing agency will report test results promptly and in writing to Contractor and Architect.
55
- 56 D. Remove and replace work where test results indicate that it does not comply with specified requirements.

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E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. All angles and miscellaneous metals to be set in masonry.
- B. All angles and miscellaneous steel supports for locker benches and shelves. Provide T in lieu of angle for fastening to support adjacent boards in corners. See 06 73 00.
- C. Steel door frame and stops, see 08 71 00 and drawings.
- D. Metal accessories.
 - 1. Including, but not limited to, anchors, bolts, screws, joist hangers, and fasteners.
- E. Misc. Metal Brackets, supports, etc. as shown on drawings.

1.03 RELATED WORK

- A. Cold-Formed Metal Framing: Section 05 40 00.
- B. Unit Masonry: Section 04 20 00.
- C. Rough Carpentry: Section 06 10 00.
- D. Composite Lumber: Section 06 73 00.
- E. Painting: Section 09 90 00.
- F. Laundry and Toilet Accessories: 10 28 00 for coat hooks.

1.04 REFERENCES

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

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- 1 A. Take field measurements prior to shop drawing preparation and fabrication.
2
3 B. Comply with the provisions of the following except as otherwise indicated:
4 1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
5 2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for
6 Buildings", including the "Commentary" and Supplements thereto as issued.
7 3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by
8 the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
9 4. AWS D1.1 "Structural Welding Code".
10
11 C. Qualify welding process and welding operators in accordance with the AWS "Standard
12 Qualification Procedure". Provide certification that welders to be employed in the work have
13 satisfactorily passed AWS qualification tests within the previous twelve months. If recertification of
14 welders is required, retesting will be the Contractor's responsibility.
15
16 D. Structural Performances
17 1. Benches and shelves shall be capable of withstanding a uniform load of 100 lbs. per sq. ft. or
18 a concentrated load of 300 lbs. located to produce maximum stress conditions.
19
20 E. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
21 Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for
22 reassembly and coordinated installation.
23

24 1.07 DELIVERY, STORAGE AND HANDLING
25

- 26 A. Package, handle, deliver and store at the job site in a manner that will avoid damage or deformation.
27 Damaged material will be rejected.
28
29 B. Items to be built into concrete, masonry, etc. shall be furnished by the respective contractor and the
30 contractor shall build this into the work as the work progresses.
31

32 1.08 PROJECT CONDITIONS
33

- 34 A. Verify dimensions in field for pre-cut or prefabricated items.
35
36 B. Examine job conditions and adjoining construction which may affect the acceptability of the work.
37
38 C. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates,
39 and directions for installing embedments and other items that are to be embedded in concrete.
40 Deliver such items to Project site in time for installation.
41

42 1.09 SUSTAINABLE DESIGN REQUIREMENTS
43

- 44 A. Recycled content: Provide products manufactured from recycled content as specified.
45 1. Steel: Minimum 75% post-consumer recycled content.
46 2. Stainless steel: Minimum 50% post-consumer recycled content.
47 3. Aluminum: Minimum 50% post-consumer recycled content.
48
49 B. Regional Materials: Provide materials or products that have been extracted, harvested, or recovered,
50 as well as manufactured, within 500 miles of the project site.
51 1. Steel: 50%.
52
53 C. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
54 site must meet the limitations and restrictions concerning chemical components set by the following
55 standards:
56 1. Topcoat Paints, Green Seal Standard GS-11, Paints: First Edition, May 20, 1993.

- 1 2. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints",
2 Second Edition, January 7, 1997. For applications on ferrous metal substrates.
3 3. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
4 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
5 January 1, 2004.
6
7 D. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
8 (defined as inside the weatherproofing system and applied on site) must not exceed the following
9 requirements.
10 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
11 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
12 2005.
13 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
14 effect on October 19, 2000.
15

16 PART 2 - PRODUCTS

17
18 2.01 METAL FOR FABRICATIONS

- 19
20 A. Cold-rolled carbon steel sheets: ASTM A336.
21
22 B. Structural Steel Sheet: Hot rolled ASTM A570, or cold-rolled ASTM A611, of grade required for
23 design loading, minimum of Grade C.
24
25 C. Welding materials: AWS D1.1; type required for materials being welded.
26
27 D. Shop coat primer: FS-TT-P-32, for shop application and field touch-up.
28
29 E. Touch-up primer for galvanized surfaces.
30 1. Steel shapes and fasteners, in general, for exterior use and where built into exterior wall: zinc
31 coated.
32
33 F. Structural Steel: ASTM A36.
34
35 G. Structural Steel Angles: ASTM A36, hot dipped galvanized.
36
37 H. Steel Pipe: ASTM A53, Type S, Grade A, standard weight, schedule 40.
38
39 I. Steel Bars and Bar Size Shapes: ASTM A 306, Grade 65, or ASTM A 36.
40
41 J. Castings: Gray iron, ASTM A48-83 Class 35B; or Ductile iron ASTM A536-80 Grade 65-45-12.
42

43 2.02 ACCESSORIES

- 44
45 A. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM
46 A 47 or cast steel ASTM A 27. Provide bolts, washers and shims as require, hot-dipped galvanized,
47 ASTM A 153.
48
49 B. Fasteners: Including, but not limited to the following;
50 1. Provide zinc-coated fasteners for exterior use where built into exterior walls or where shown
51 on drawings. Select fasteners for the type, grade and class required.
52 a. Provide hot-dipped galvanized coating for fasteners less than 1/2" diameter that are in
53 contact with pressure-treated wood.
54 2. Bolts and Nuts: Regular hexhead type, ASTM A 307, Grade A or Type 304 stainless steel,
55 ASTM A 320. High Strength bolts and nuts, ASTM A 325.
56 3. Lag Bolts: Type, FS FF-B-561.

4. Machine Screws: Cadmium plated steel, FS FF-S-92, Security Screw
 5. Wood Screws: Carbon steel, FS FF-S-111.
 6. Plain Washers: Round, carbon steel, FS FF-W-92.
 7. Concrete Anchorage Devices: Wedge-type expansion bolts, FS FF-S-325, Group II, Type 4, Class I, zinc coated or stainless steel as shown on the drawings and installed in accordance with manufacturer's recommendations.
 - a. "Kwik-bolt", Hilti Corporation.
 - b. "Wej-it", Wej-it Corporation.
 8. Masonry Sleeve Anchors: zinc coated or stainless as shown on the drawings.
 - a. Rawl "Lok/Bolt".
 - b. HILTI - Sleeve anchor.
 9. Toggle Bolts: Spring-wing type, FS FF-B-558, Type I, Class I and Style 1 zinc coated or stainless steel as shown on the drawings.
 10. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
 11. Epoxy bolt anchorage: HILTI (HY-10 or equal)
- C. Electrodes for Welding: Comply with AWS code.

2.03 FABRICATION

- A. Weld permanent connections wherever possible; use continuous welds where exposed. Grind smooth all welds where exposed; straighten members after welding.
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- B. Do shop cutting, drilling, fitting wherever possible. Field measure before fabrication when necessary or required.
- C. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, security (countersunk) screws or bolts.
- F. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

2.04 STEEL FINISHES

- A. Preparation for Shop Painting: Clean steel items free of mill scale, rust and foreign matter, grease, oil, dust, and dirt in accordance with SSPC SP-2, SP-3, or SP-7.
- B. Shop Priming: Apply one shop coat of metal primer using manufacturer's standard primer, except stainless steel, galvanized steel, and other non-ferrous items.

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PART 3 - EXECUTION

3.01 INSTALLATION

- A. Anchorage to masonry with expansion bolts, sleeves, toggle bolts or approved similar. Do not use wood plugs for anchorage.
- B. Bolts, screws, and similar fastenings for field connections shall be of the same material and finish as the parts being fastened.
- C. Immediately after erection, repaint field connections, weld burns, abraded surfaces. Scrape and wire brush loose and scaling paint to sound metal, follow with spot priming.
- D. Install manufactured units and specialty products in accordance with the manufacturer's instructions and approved shop drawings.
- E. Do not proceed with installation until conditions are satisfactory.
- F. Install in accordance with approved shop drawings.
- G. Perform field welding in accordance with AWS D1.1.
- H. Corrosion Protection: Coat concealed metal surfaces that will come into contact with grout, concrete, or dissimilar metals with a heavy coat of bituminous paint.
- I. Anchor powder coated flat stock to interior walls by drilling holes for ¼ inch studs and anchoring with epoxy.

3.02 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Protect stainless steel finishes from contamination by materials containing iron.

END OF SECTION

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SECTION 06 73 00

COMPOSITE LUMBER

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Composite Lumber.

1.03 RELATED WORK

- A. Section 05 50 00: Metal Fabrications for Brackets and Steel Door Frame

1.04 REFERENCE STANDARDS:

- A. ASTM International (ASTM):
 1. ASTM D2395 – Standard Test Methods for Specific Gravity of Wood and Wood-Based Materials.
 2. ASTM D7032 – Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails.
 3. ASTM G154 – Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

1.05 SUBMITTALS

- A. Product Data: Standard specifications, and descriptive literature for primary and secondary products, including:
 1. Spec-Data product information sheets.
 2. Catalog cut-sheets.
 3. Color charts.
- B. Shop Drawings: Graphic information specifically prepared for this Project, including:
 1. Dimensioned plans, elevations, and construction details indicating full extent of composite decking work complete with substrate construction, decking patterns, attachments, accessories, conditions at adjacent materials, perimeters and penetrations.
 2. Verified field dimensions.
- C. Selection Samples: Color chips for initial color selection prepared on same material as specified products.
- D. Verification Samples: Actual decking and trim pieces, 12 inches (305 mm) long, illustrating color, texture and finish selected by Architect.
- E. Manufacturer's Instructions, including:
 1. Delivery, storage and handling.
 2. Preparation and Installation.
 3. Maintenance.
- F. Commercial Product Warranties: Manufacturer's commercial series of prorated limited warranties including; 10-years against manufacturing defects of composite decking, 20-years against manufacturing defects of metal clips, and 25-years against staining and fading of composite decking.

1
2 1.06 QUALITY ASSURANCE
3

- 4 A. Installer Qualifications: Manufacturer's authorized dealer-installer.
5

6 1.07 DELIVERY, STORAGE AND HANDLING
7

- 8 A. Deliver, store and handle composite decking in accordance with manufacturer's instructions.
9

10
11 PART 2 PRODUCTS
12

13 2.01 COMPOSITE LUMBER BOARDS
14

15 A. Manufacturer:

- 16 1. Trex
17 2. TimberTex
18 3. NewTechWood, Ltd
19 4. Or Approved Equal
20

- 21 B. Description: composite lumber composed of recycled hardwood fiber and high-density
22 polyethylene (HDPE) core, encased in 1/64 inch to 1/32 inch thick UV and stain resistant plastic
23 shell with core and shell co-extruded under high temperature forming a single combined product;
24 meeting ASTM D7032 and ASTM G154.

- 25 1. Profile: All boards to be square edge boards.
26 2. Board sizes: 5-1/2 inches wide by 1.3 inch (2") and .82 inch (1") thick. Full bench/shelf
27 length as indicated on drawings.
28 3. Color: As per selected by Architect from Manufacturer's full line. Matte finish.
29 4. Texture: Embossed wood grain one side, smooth one side.
30 5. Properties:
31 a. Density: 7.2 lb/ft³; meeting ASTM D2395.
32
33 6. Installation method: Concealed fasteners and exposed composite screws.
34

35 2.02 ACCESSORIES
36

- 37 A. Concealed Fasteners: T-Clip for concealed attachment of decking boards with 1/4 inch gap be-
38 tween boards.
39
40 B. Starter Clips: for concealed attachment of boards butted up against vertical walls.
41
42

43 PART 3 EXECUTION
44

45 3.01 EXAMINATION
46

- 47 A. Verify that conditions of work previously installed under other sections or contracts are
48 acceptable for installation of composite decking in accordance with manufacturer's instructions
49 and approved submittals.
50 1. Notify Architect of unacceptable conditions upon discovery.
51 2. Do not proceed with preparation and installation until unacceptable conditions have been
52 corrected.
53

54 3.02 PREPARATION
55

- 56 A. Prepare substrate to receive composite decking in accordance with manufacturer's instructions,
57 and approved submittals.
58

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3.03 INSTALLATION

- A. Install composite decking in accordance with manufacturer's instructions, and approved submittals.

3.04 CLEANING

- A. Clean-up packaging, waste material, and construction debris daily during installation; legally dispose of in accordance with authorities having jurisdiction.
- B. Upon completion, remove surplus materials, remaining debris, tools and equipment.

3.05 PROTECTION

- A. Protect installed products from damage during subsequent construction until Final Inspection and acceptance by Owner.
- B. Repair damage to adjacent materials caused by installation of composite decking.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Miscellaneous Joints.

1.03 RELATED WORK

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

1.04 SUBMITTALS

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

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

PART 3 - EXECUTION

3.01 JOINT PREPARATION

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

3.02 SEALANT APPLICATION, GENERAL

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

3.03 PROTECTION

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

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

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

1.03 RELATED WORK

- A. Joint Sealants: 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. ANSI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
- C. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings
- D. ANSI A250.5 Accelerated Physical Endurance Test Procedure for Steel Doors, Frames, and Frame Anchors
- E. ANSI A250.6 Hardware on Steel Doors (Reinforcement --Application)
- 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-Steel Door Institute
- K. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
- L. ASTM A240/A240M Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel

- 1
- 2 M. ASTM A366 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
- 3
- 4 N. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy,
- 5 Hot-Rolled and Cold-Rolled, General Requirements
- 6
- 7 O. ASTM A569 Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled
- 8 Sheet and Strip Commercial Quality
- 9
- 10 P. ASTM A591 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for light Coating
- 11 Mass Applications
- 12
- 13 Q. ASTM A620 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Drawing Quality,
- 14 Special Killed
- 15
- 16 R. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
- 17 Alloy-Coated (Galvanealed) by the Hot-Dip Process
- 18
- 19 S. ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated
- 20 by the Hot-Dip Process
- 21
- 22 T. NFPA-101-94: Life Safety Code.
- 23
- 24 U. American Welding Society

25

26 1.05 SUBMITTALS

27

- 28 A. Submit in accordance with the General Conditions of the Contract.
- 29 1. Manufacturer's technical product data substantiating that products comply with
- 30 requirements.
- 31 2. Shop Drawings for fabrication and installation of steel doors and frames. Include details
- 32 of each frame type, elevations of door design types, conditions at openings, details of
- 33 construction, location and installation requirements of finish hardware and
- 34 reinforcements, and details of joints and connections. Show anchorage and accessory
- 35 items.
- 36 a. Provide schedule of doors and frames using same reference numbers for details
- 37 and openings as those on contract drawings.
- 38
- 39 3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
- 40 testing agency, for each type of hollow metal door and frame assembly.
- 41

42 1.06 QUALITY ASSURANCE

43

- 44 A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

45

46 1.07 DELIVERY, STORAGE, AND HANDLING

47

- 48 A. Deliver hollow metal work cartoned or crated to provide protection during transit and job
- 49 storage.
- 50 1. Provide additional protection to prevent damage to finish of factory-finished units.
- 51
- 52 B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to
- 53 jambs and mullions.
- 54

- 1 C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided
2 refinished items are equal in all respects to new work and acceptable to Construction Manager;
3 otherwise, remove and replace damaged items as directed.
4
- 5 D. Store doors and frames at building site under cover. Place units on minimum 4 inch high wood
6 blocking. Avoid use of non-vented plastic or canvas shelters which could create a humidity
7 chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4
8 inch spaces between stacked doors to promote air circulation.
9

10 1.08 PROJECT CONDITIONS

- 11
- 12 A. Examine the openings and conditions under which hollow metal work is to be installed. Do not
13 proceed with the work until unsatisfactory conditions have been corrected.
14

15 PART 2 - PRODUCTS

16

17 2.01 MANUFACTURERS, HOLLOW METAL

- 18
- 19 A. Amweld Building Products
20
21 B. Ceco Door Products
22
23 C. Curries Company
24
25 D. Kewaunee Corporation
26
27 E. Mesker Door, Inc.
28
29 F. Steelcraft
30
31 G. Or approved equal.
32

33 2.02 MATERIALS

- 34
- 35 A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for
36 exposed applications.
37
- 38 B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale,
39 pitting, or surface defects; pickled and oiled.
40
- 41 C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill
42 phosphatized.
43 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008 or
44 ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
45
- 46 D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
47
- 48 E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated,
49 fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching
50 hollow metal frames of type indicated.
51
- 52 F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C
53 143/C 143M.
54
- 55 G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of
56 fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum

1 flamespread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for
2 combustion characteristics.

- 3
- 4 H. Glazing: Comply with requirements in Division 08 Section "Glazing."
- 5
- 6 I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film
7 thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur
8 components, and other deleterious impurities.
- 9
- 10 J. Steel: Commercial quality, level, cold-rolled steel conforming to ASTM A366, free of scale and
11 surface defects. Commercial quality hot rolled and pickled steel conforming to ASTM A569
12 may be used as option for interior frames. Standard hollow metal frame gauges are as follows
13 (Bullet Resistant must meet specified resistance level):
- 14 1. Interior Frames: 16-gage.
 - 15 2. Exterior Frames: 14-gage.
 - 16 3. Flush Doors: 16-gage (exterior), 18-gage (interior).
 - 17 4. Rough Bucks and Stiffeners: 12-gage.
 - 18 5. Miscellaneous Trim: 16 gage.
- 19

20 2.03 FABRICATION, GENERAL

21

- 22 A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal
23 to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and
24 assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify
25 work that cannot be permanently factory assembled before shipment.
- 26
- 27 B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- 28
- 29 C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-
30 rolled steel sheet.
- 31
- 32 D. Fabricate doors to a maximum tolerance of 1/16 inch from a straight edge when laid on face of
33 door in any direction, including diagonal.
- 34
- 35 E. Provide proper Underwriters' Laboratory (UL) labels. Labeled doors shall have equal labeled
36 frames.
- 37
- 38 F. Clearances
- 39 1. Edge clearances shall be provided as follows:
 - 40 a. Between doors and frame, at head and jambs - 1/8 inch.
 - 41 b. At door sills:
 - 42 1) Where no threshold is used - 3/8 minimum.
 - 43 2) Where threshold is used - 1/4 inch maximum between door & threshold.
- 44
- 45 G. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware;
46 include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware
47 Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- 48 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 49 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door
50 hardware.
 - 51 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series
52 specifications for preparation of hollow metal work for hardware.
 - 53 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26
54 Sections.
- 55

- 1 H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners
2 of stops and moldings with butted or mitered hairline joints.
3 1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
4 frames.
5 2. Provide loose stops and moldings on inside of hollow metal work. Coordinate rabbet width
6 between fixed and removable stops with type of glazing and type installation indicated.
7

8 2.04 HOLLOW METAL FRAME FABRICATION
9

- 10 A. Provide metal frames of the types and styles indicated on the drawings or schedules and
11 complying with SDI for materials and construction requirements.
12
13 B. Provide metal frames for doors, transoms, sidelights, borrowed lites, and other openings, as
14 shown on drawings.
15
16 C. Provide integral channel frames, sub frames and stiffeners to structure where indicated or
17 required for fastening and stiffening frames.
18
19 D. Provide steel spreader temporarily attached to feet of both jambs for welded frames.
20
21 E. Completely clean all frames by degreasing process, followed by one coat rust inhibitive primer
22 equal to withstand a salt spray test (5% solution) of 70 hours. Thoroughly prime all surfaces
23 without runs, smears, or bare spots, and under and inside all removable stops.
24
25 F. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment
26 plates or angles at each joint, fabricated of same thickness metal as frames.
27
28 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth,
29 flush, and invisible.
30 2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints,
31 fabricated from same material as door frame. Fasten members at crossings and to jambs by
32 butt welding.
33 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners
34 unless otherwise indicated.
35 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
36 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds
37 per anchor.
38 6. Jamb Anchors: Provide number and spacing of anchors as follows:
39 a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of
40 frame. Space anchors not more than 32 inches o.c. and as follows:
41 1) Two anchors per jamb up to 60 inches high.
42 2) Three anchors per jamb from 60 to 90 inches high.
43 3) Four anchors per jamb from 90 to 120 inches high.
44 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or
45 fraction thereof above 120 inches high.
46 b. Compression Type: Not less than two anchors in each jamb.
47 c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and
48 bottom of frame. Space anchors not more than 26 inches o.c.
49
50 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as
51 follows. Keep holes clear during construction.
52 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
53 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
54

55 2.05 HOLLOW METAL DOOR FABRICATION
56

- 1 A. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not
2 less than 16-gauge, full width spot welded to both faces.
- 3
- 4 B. All doors to be flush with seamless edges i.e., provide continuous flush end closures,
5 continuously welded in place and ground smooth.
- 6
- 7 C. Hardware location per manufacturer recommended heights to meet ADA requirements.
- 8
- 9 D. Completely clean all doors of impurities and pressure sand to a smooth surface and correct all
10 irregularities with metallic putty sanded smooth. Provide one spray coat of primer, baked on.
11 Thoroughly paint unexposed inside surfaces of exterior doors, fire doors, and other doors
12 occurring in excessive moisture area.
- 13
- 14 E. Provide weep-hole openings in bottom of doors to permit moisture to escape. Seal joints in top
15 edges of doors against water penetration.
- 16
- 17 F. Louvers: Factory cut openings in doors.
- 18

19 2.06 STANDARD HOLLOW METAL DOORS

- 20
- 21 A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth
22 surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with
23 ANSI/SDI A250.8.
- 24 1. Design: As indicated.
- 25 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene,
26 polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
- 27 a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with
28 thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when
29 tested according to ASTM C 1363.
- 30 1) Locations: Exterior doors and doors that connect the main (office and Medical
31 Examiner Suite) portion of the building to Garage, 150.
- 32
- 33 3. Vertical Edges for Single-Acting Doors: Beveled edge.
- 34 a. Beveled Edge: 1/8 inch in 2 inches.
- 35
- 36 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or
37 channels of same material as face sheets.
- 38 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Door and
39 Frames."
- 40
- 41 B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying
42 with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and
43 ANSI/SDI A250.4 for physical performance level:
- 44 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
- 45
- 46 C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from
47 same material as door face sheets.
- 48
- 49 D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel
50 sheet.
- 51
- 52 E. Provide vision proof louvers where schedule. 18 ga. frame, 24 ga blades. Powdercoat to match
53 door, architect to selected color from manufacturer's full range.
- 54

55 2.07 STANDARD HOLLOW METAL FRAMES

- 1 A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
2
3 B. Exterior Frames: Fabricated from metallic-coated steel sheet.
4 1. Fabricate frames with mitered or coped corners.
5 2. Fabricate frames as face welded unless otherwise indicated.
6 Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
7
8 C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from
9 same material as frames.

10
11 2.08 FRAME ANCHORS
12

- 13 A. Jamb Anchors:
14 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less
15 than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10
16 inches long; or wire anchors not less than 0.177 inch thick.
17 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
18 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter
19 bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat
20 reinforcement plate, welded to frame at each anchor location.
21
22 B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
23 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
24 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing
25 not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
26

27 2.09 STOPS AND MOLDINGS
28

- 29 A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high
30 unless otherwise indicated.
31
32 B. Cut-Off Stops:
33 1. Angled stop terminates 6-inches above the floor, closed at a 45 degree angle.
34 2. See Door Schedule for locations.
35

36 2.010 STEEL FINISHES
37

- 38 A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
39 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer
40 complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer
41 manufacturer for substrate; compatible with substrate and field-applied coatings despite
42 prolonged exposure.
43 2. Ensure primer is compatible with finish coats scheduled.
44

45 PART 3 - EXECUTION
46

47 3.01 EXAMINATION
48

- 49 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
50 for installation tolerances and other conditions affecting performance of the Work.
51
52 B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame
53 installation.
54
55 C. Proceed with installation only after unsatisfactory conditions have been corrected.
56

1 3.02 PREPARATION

- 2
- 3 A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding,
- 4 filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed
- 5 faces.
- 6
- 7 B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness,
- 8 alignment, twist, and plumbness to the following tolerances:
- 9 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb
- 10 perpendicular to frame head.
- 11 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane
- 12 of wall.
- 13 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines,
- 14 and perpendicular to plane of wall.
- 15 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to
- 16 floor.
- 17
- 18 C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door
- 19 hardware.
- 20

21 3.03 INSTALLATION

- 22
- 23 A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place;
- 24 comply with Drawings and manufacturer's written instructions.
- 25
- 26 B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with
- 27 ANSI/SDI A250.11.
- 28 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent
- 29 anchors are set. After wall construction is complete, remove temporary braces, leaving
- 30 surfaces smooth and undamaged.
- 31 a. Where frames are fabricated in sections because of shipping or handling limitations,
- 32 field splice at approved locations by welding face joint continuously; grind, fill,
- 33 dress, and make splice smooth, flush, and invisible on exposed faces.
- 34 b. Install frames with removable glazing stops located on secure side of opening.
- 35 c. Install door silencers in frames before grouting.
- 36 d. Remove temporary braces necessary for installation only after frames have been
- 37 properly set and secured.
- 38 e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as
- 39 necessary to comply with installation tolerances.
- 40 f. Field apply bituminous coating to backs of frames that are filled with grout
- 41 containing antifreezing agents.
- 42
- 43 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and
- 44 secure with postinstalled expansion anchors.
- 45 a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled
- 46 expansion anchors if so indicated and approved on Shop Drawings.
- 47
- 48 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- 49 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between
- 50 frames and masonry with grout.
- 51 5. Completely fill jambs and head of hollow metal door frames in masonry walls with grout.
- 52 6. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions,
- 53 including bracing frames, to ensure that frames are not deformed or damaged by grout
- 54 forces.

- 1 7. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled
2 expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on
3 exposed faces.
- 4 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural
5 supports or substrates above frame unless frame is anchored to masonry or to other structural
6 support at each jamb. Bend top of struts to provide flush contact for securing to supporting
7 construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- 8 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist,
9 and plumb to the following tolerances:
- 10 a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees
11 from jamb perpendicular to frame head.
- 12 b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel
13 to plane of wall.
- 14 c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on
15 parallel lines, and perpendicular to plane of wall.
- 16 d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- 17
- 18 C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified
19 below. Shim as necessary.
- 20 1. Non-Fire-Rated Standard Steel Doors:
- 21 a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
- 22 b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
- 23 c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
- 24 d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
- 25
- 26 D. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames",
27 unless otherwise indicated.
- 28 1. Except for frames located at in-place concrete or masonry and at drywall installations,
29 place frames prior to construction of enclosing walls and ceilings. Set frames accurately
30 in position, plumbed, aligned, and braced securely until permanent anchors are set. After
31 wall construction is completed, remove temporary braces and spreaders leaving surfaces
32 smooth and undamaged.
- 33 2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
- 34 3. At in-place concrete or masonry construction, set frames and secure to adjacent
35 construction with machine screws and masonry anchorage devices.
- 36 4. Install fire-rated frames in accordance with NFPA Std. No. 80.
- 37 5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.
38 In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed
39 steel stud partitions, attach wall anchors to studs with self-tapping screws.
- 40 6. Fill heads of fasteners with body putty, grind smooth and touch-up prime.
- 41
- 42 E. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
- 43

44 3.04 ADJUSTING AND CLEANING

- 45
- 46 A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply
47 touch-up of compatible air-drying primer.
- 48
- 49 B. Remove grout and other bonding material from hollow metal work immediately after
50 installation.
- 51
- 52 C. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged
53 and in complete and proper operating condition. Remove and replace defective work, including
54 hollow metal work that is warped, bowed, or otherwise unacceptable.
- 55

56

END OF SECTION 08 11 13

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED WORK

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

1.02 SUMMARY

- A. This section includes the following:
 - 1. Access doors and frames.

1.03 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
 - 1. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following
 - a. Method of attaching door frames to surrounding construction.
 - b. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, and special trim.
 - c. Existing access door locations and sizes for replacement in walls receiving wall tile.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 ENVIRONMENTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Access Doors:
 - a. Cesco Products.
 - b. Bar-Co, Inc. Div.; Alfab, Inc.
 - c. J. L. Industries, Inc.

- d. Karp Associates, Inc.
- e. Milcor Limited Partnership.

2.02 MATERIALS

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

2.03 PAINT

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

2.04 ACCESS DOORS AND FRAMES

- A. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Various locations and surfaces, assembly to be manufactured for specific applications.
 - 2. Sizes:
 - a. 18" x 18"
 - b. 68" x 32" equal to Cesco Model AHF-T2 or approved equal. Key access only, no handles. Ceiling mounted. Stainless steel continuous hinge. Uninsulated.
 - c. or as shown in drawings, or to match existing size.
 - 3. Door: Sheet metal, gauged to door size, minimum 20 gauge metal set flush with surrounding finish surfaces.
 - 4. Frame: To be manufactured specifically for the surrounding material for flush/integral installation, minimum 16 gauge metal flange.
 - a. Drywall bead for gypsum board.
 - b. Fire Rated doors to be place in fire rated assemblies or as noted on drawing.

- 1 1) All fire rated doors to maintain at least a minimum of the hour rating of the
- 2 assembly into which it is placed.
- 3 2) Fire doors shall have automatic closure, be self latching, and contain
- 4 interior latch release.
- 5 c. Other as needed.
- 6
- 7 5. Hinges:
- 8 a. Spring-loaded concealed pin type.
- 9 b. Stainless steel continuous hinge.
- 10
- 11 6. Latch:
- 12 a. Screwdriver-operated cam latch.
- 13 b. Key operated security lock.
- 14

15 2.05 FABRICATION

- 16
- 17 A. General: Provide access door assemblies manufactured as integral units ready for installation.
- 18
- 19 B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials
- 20 with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam
- 21 marks, roller marks, rolled trade names, or roughness.
- 22
- 23 C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces.
- 24 Furnish attachment devices and fasteners of type required to secure access panels to types of
- 25 supports indicated.
- 26
- 27 D. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge
- 28 trim for gypsum board securely attached to perimeter of frames.
- 29
- 30 E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when
- 31 closed.
- 32
- 33 F. All access doors to be fabricated and properly installed in such a manner as to maintain the fire
- 34 rating of the assembly into which it is placed.
- 35
- 36 G. UL listed for use in fire rated partitions if required by the application.
- 37

38 2.06 FINISHES, GENERAL

- 39
- 40 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
- 41 recommendations for applying and designating finishes.
- 42
- 43 B. Finish metal fabrications after assembly.
- 44

45 2.07 METALLIC-COATED STEEL FINISHES

- 46
- 47 A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with
- 48 applicable standard listed below:
- 49 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
- 50 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- 51
- 52 B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and
- 53 other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited
- 54 to the organic coating to be applied over it. For metallic-coated surfaces, clean welds,
- 55 mechanical connections, and abraded areas, and apply galvanizing repair paint specified below
- 56 to comply with ASTM A 780.

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- 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.
- C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pre-treating.
- D. Stainless Steel: Type No. 304 stainless steel with No. 4 satin polish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install according to manufacturer’s instructions.
 - 1. Doors to be installed plumb/level/square as surfaces require.
 - 2. Maintain even gap between frame and door.
- B. Stainless steel access panels are to be installed for use in toilets, showers, similar wet areas and in any space in the Autopsy Suite proper.

3.02 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.
- C. Remove all packaging material upon completion.

END OF SECTION 08 31 13

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Door Hardware

1.03 RELATED SECTIONS

- A. Hollow Metal Doors and Frames: Section 08 11 13.
- B. 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 the General Conditions of the Contract.
 - 1. Five (5) copies of a detailed, vertical type hardware schedule for approval.
 - a. List and describe each opening separately. Include doors with identical hardware, except hand, in a single heading. Include door number, room designations, degree of swing, and hand.
 - b. List related details. Include dimensions, door and frame material, and other conditions affecting hardware.
 - c. List all hardware items. Include manufacturer's name, quantity, product name, catalog number, size, finish, attachments, and related details.
 - d. Resubmit four (4) copies of the corrected schedule when required.
 - e. Determine keying requirements, as directed by the Owner's Representative and submit five (5) copies of a detailed keying schedule for approval; resubmit four copies (4) of the corrected schedule when required. Reinstalled salvaged hardware is included in the scope of the work.
 - 2. Samples of hardware items as may be required. Identify each sample and indicate the location of subsequent installation in the project.

3. A copy of the approved hardware schedule and all pertinent templates or template information to each fabricator of material factory-prepared for the installation of hardware.

1.06 QUALITY ASSURANCE

- A. Manufacturers and product numbers listed herein establish a standard of quality. Similar items by other manufacturers may be accepted by prior approval in accord with the General Conditions of the Contract. Except where specified in the hardware schedule, furnish products of only one manufacturer for each type of hardware.
- B. Supplier: Hardware Supplier: The hardware supplier shall be a corporate member in good standing of The Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is currently participating in DHI's continuing education program (CEP).
- C. Items of hardware not definitely specified herein but necessary for completion of the Work shall be provided. Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required. Include such nuances as strike type, strike lip, raised barrel hinges, mounting brackets, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.

1.07 REGULATORY REQUIREMENTS

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

1.08 DELIVERY, STORAGE AND HANDLING

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 ACCESSORIES

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

PART 3 - EXECUTION

3.01 INSTALLATION

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

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

3.02 ADJUSTING

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

3.03 CLEANING

- A. Clean all hardware to restore the original finish.

3.04 PROTECTION

- A. Protect the finished installation until acceptance of the project.

3.05 HARDWARE SCHEDULE

- A. Manufacturers
 - 1. Hinges
 - a. Approved Equals: Hager Hinge Co. HAG
Stanley
McKinney
 - 2. Lockset
 - a. Approved Equals: Best Access Systems BES
Provide 7-pin cylinders to match existing. Coordinate with Best Access Systems for keying of project, No Substitutions. Best Access Systems is indicated in this specification as a basis of design, Marshall Best Security Corporation to accept Best Access System Core is an acceptable equal.
 - 3. Door Closers
 - a. Approved Equals: Model 4010/4110 LCN
No Substitutions
 - 4. Kickplate
 - Rockwood Mfg. Co ROC
 - 5. Biometric Hand Readers
 - Schlage Recognition Systems SCH
 - 6. Electric Strikes
 - a. Approved Equals: Von Duprin VON
HES
Folger Adams
 - 7. Door Position Switch
 - SENTROL LCK
 - 8. CHW Clothes Hook Wall
 - 10 28 00
 - 9. Coat Hook
 - 10 28 00

B. Hardware Sets:

SET 1

1 EA CONTINUOUS HINGE	780-112HD	CLR HAG coord w/ steel door/frame
1 EA DEADBOLT	MBT-3-S	626 MARSHALL BEST
1 EA GATEBOX	COORD W/ HARDWARE	KEEDEX

Paint Gate Box to match steel door/frame

Coordinate with 05 50 00. Allow door to be locked in the closed or open position.

SET 2

1 EA CONTINUOUS HINGE	780-112HD	CLR HAG
1 EA DEADBOLT	L460BD	630 SCHLAGE
1 EA OCCUPANCY INDICATOR	L283-414	630 SCHLAGE
1 EA CYLINDER	AS REQUIRED	626 BEST
1 EA PULL	RM3202 CTC24"	630 ROCKWOOD
1 EA PUSH PLATE	70C	630 ROCKWOOD
1 EA OVERHEAD STOP	100S	612 GJ

SET 3

1 EA CONTINUOUS HINGE	780-112HD	CLR HAG
1 EA PUSH PLATE	70C	630 ROC
1 EA PULL	RM3202 CTC24"	630 ROC
1 EA OVERHEAD STOP	100S	612 GJ
1 EA CLOSER	4010/4110	689 LCN
1 EA KICKPLATE	10" x 1 1/2" LDW	630 IVE
1 EA CYLINDER	AS REQUIRED	626 BEST

END OF SECTION 08 71 00

SECTION 09 29 00

GYP SUM BOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Gypsum Board and Gypsum Board Assemblies (Metal Studs)
- B. Trim and Accessories.

1.03 RELATED WORK

- A. Section 05 40 00, Cold-Formed Metal Framing
- B. Section 06 10 00, Rough Carpentry
- C. 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 the General Conditions of the Contract.
 - 1. Manufacturer's product data including acoustic sealant.
 - 2. Texture finish sample.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site with manufacturer's labels intact and legible.
- B. Handle materials with care to prevent damage.
- C. 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

- A. During cold weather, maintain temperature range between 55 degrees F. to 70 degrees F. for 24 hours before, during, and after gypsum board and joint treatment applications.
- B. Ventilation
 - 1. Provide ventilation during and following adhesive and joint treatment applications.

2. Use temporary air circulators in enclosed areas lacking natural ventilation.
3. Protect installed materials from drafts during hot, dry weather.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Georgia Pacific.
- B. LaFarge.
- C. National Gypsum Company.
- D. United States Gypsum Company.
- E. Dietrich Industries.
- F. Chicago Metallic.
- G. Certainteed Gypsum
- H. American Gypsum
- I. Reef Industries
- J. Fry Reglet Architectural Metals
- K. Or approved equal.

2.02 MATERIALS

- A. Gypsum Board: ASTM C 36, long edges tapered; in lengths as long as practical to keep number of end joints to absolute minimum.
 1. Regular Gypsum Board.
 2. Abuse-resistant Gypsum Board: USG Fiberock AR.
 3. Water Resistant Wallboard: 5/8-inch thick.
 4. Fire Code Board: Type "X" or Fire code "C".
 5. Embedded Glass Reinforced Gypsum Sheathing. 1/4" or as shown on drawings.
 - a. Certainteed "ProRoc 14" Flex" or approved equal.
 6. Cementitious Backer Board: Aggregated, Portland cement board with woven, glass fiber, mesh facing; complying with ANSI A118.9.
 - a. Manufacturer: USG, Durock Interior Tile Backer Board.
 - b. Thickness: 1/2 inch or 5/8 inch as shown on drawings.
 7. Or approved equal.
- B. 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. All exterior non-structural metal framing, including but not limited to Z furring and studs shall be 16 ga. Galvanized.
- C. Suspension System
 1. Chicago Metallic 640 system.
 - a. Hanger Wire: 8-gage, annealed.

- 1 b. Carrying Channels: 1-1/2 inch cold rolled steel.
- 2 c. Screws: USG 1-inch type S.
- 3 d. Furring Channels: USG metal furring channel, attached with USG furring channel
- 4 clips.
- 5
- 6 D. Accessories
- 7 1. Metal Trim: USG No. 200-A or approved equal.
- 8 2. L-shaped Metal Trim USG No. 801-B.
- 9 3. Metal Reveal Molding: Fry Reglet DRM-625-75.
- 10 4. Metal Reveal Molding: Fry Reglet DRM-625-200.
- 11 5. Metal 'Z' Reveal Molding, 1/4" wide: Fry Reglet DRMZ-625-25.
- 12 6. Metal "Z" Reveal Molding, 1/2" deep X 1/2" wide: Fry Reglet DRMZ-50-50
- 13 7. Metal 'Z' Reveal Molding 5/8" wide X 1/2" deep Fry-Reglet DRMZ- 625-50.
- 14 8. Metal 'Z' Reveal Molding, 1" wide: Fry Reglet DRMZ-100-100.
- 15 9. Metal "Z" Reveal Molding 2" wide: Fry Reglet DRMZ-625-200
- 16 10. Expansion Joints: USG No. 093.
- 17 11. Drywall Screws for Metal Framing: 1" Type S-12 or Type S bugle head.
- 18 12. Outside Corner Reinforcement: USG No. 104, 1-1/8" x 1-1/8" corner bead.
- 19 13. Acoustical Sealant: Equal to Tremco "Tremflex 834" or Pecora "Acoustic and Insulation
- 20 Sealant", low VOC formulation.
- 21 a. VOC content less than 50 g/l.
- 22 14. Sound Attenuation Blanket: U.S. Gypsum Thermafiber, 3" for an STC of 49
- 23 15. Or approved equals.
- 24
- 25 E. Drywall Finishing Accessories
- 26 1. Joint Compounds: Ready mixed type, or approved equal.
- 27 2. Joint Reinforcement: USG Perf-A-Tape, or approved equal.
- 28
- 29 F. Texture Finish Materials
- 30 1. Ceilings: USG Spray Fine Sand Texture Finish, or approved equal.
- 31 2. Walls (Painted Only): "Orange Peel".

32
33 PART 3 - EXECUTION

34
35 3.01 METAL STUDS

- 36
- 37 A. Attach metal runners at floor and at ceiling or structural elements above with suitable fasteners
- 38 located 2 inches from each end, spaced 16 inches on center.
- 39
- 40 B. Position studs vertically, engaging floor and ceiling runners. Splice studs with 8-inch nested lap,
- 41 one positive attachment per stud flange. Place studs in direct contact with all door frame jambs,
- 42 abutting partitions, partition corners, existing construction elements.
- 43
- 44 C. Anchor studs adjacent to door frames, partition intersections, and corners to ceiling and floor runner
- 45 flanges with USG metal lock fastener tool.
- 46
- 47 D. Provide double studs at jambs and head of each door frame. Securely anchor studs to jamb and head
- 48 anchor clips at metal door frames by bolt or screw attachment. Over metal frames, place a
- 49 cut-to-length section of runner horizontally with web-flange bent at each end; secure with one
- 50 positive attachment per flange. Position a cut-to length stud (extend to ceiling runner) at vertical
- 51 board joints over door frame header. Place an additional track-to-track stud 6 inches from double
- 52 jamb studs on both sides of framed openings.
- 53

54 3.02 GYPSUM BOARD

- 55
- 56 A. Follow Gypsum Association's recommendations for installation procedures.

- 1
2 B. Cut wallboards by scoring and breaking or sawing; scribe neatly at wall projections.
3
4 C. Apply first to ceilings then to walls.
5
6 D. Maintain a 5/8" space between floor and bottom edge of gypsum board.
7
8 E. Locate wallboard joints at openings so that no end joint aligns with edge of opening.
9
10 F. Set fasteners with heads slightly below surface of wallboard. Avoid breaking face paper.
11
12 G. Provide water resistant wallboard at rooms/areas with high humidity. Entire project area is high
13 humidity.
14

15 3.03 CEILING SUSPENSION SYSTEM
16

- 17 A. Suspend carrying channels with 8-gage hanger wires spaced 48 inches on center, within 6 inches of
18 ends.
19
20 B. Install carrying channels 48 inches on center and within 6 inches of walls. Provide 1 inch clearance
21 between channel ends and abutting walls, partitions.
22
23 C. At splices, interlock flanges, overlap ends 12 inches, and secure with 16-gage double standard tie
24 wire at each end.
25
26 D. Erect furring channels at right angles to carrying channels, spaced 24 inches on center and within 6
27 inches of walls. Provide 1-inch clearance between channel ends and abutting walls, partitions.
28
29 E. Secure to carrying channels with clips, or, saddle tie with 16-gage double standard tie wire. At
30 splices nest channels at least 8 inches, securely wire tie at each end.
31
32 F. Install additional cross reinforcing to restore lateral stability of suspension system at openings that
33 interrupt carrying or furring channels.
34
35 G. Apply wallboard of maximum practical length with long dimension at right angles to furring
36 channels. Position and stagger end joints over channel web. Fit ends and edges closely, but not
37 forced together.
38
39 H. Fasten board to channels with 1-inch Type S screws spaced 12 inches on center in field of board,
40 along abutting ends, edges.
41
42 I. Comply with UL Design No. D502 requirements at fire rated assembly.
43

44 3.04 EXPANSION JOINTS
45

- 46 A. At Ceilings: 50'-0" on center each way maximum.
47
48 B. At Walls: 30'-0" on center maximum.
49
50 C. Provide continuous from each door jamb to top of partition.
51
52 D. Provide at intersections with exposed masonry construction.
53

54 3.05 SINGLE LAYER/ERECTION
55

- 1 A. Position all ends, edges over framing members, except when edge joints are at right angles to
2 framing members, or when end joints are back-blocked. Apply wallboard horizontally or vertically
3 on walls to minimize the number of joints.
4
- 5 B. Attach wallboard to metal framing supports by power driven screws. For vertical application space
6 screws 12 inches on center in field of board, 8 inches on center staggered along vertical abutting
7 edges. For horizontal application space screws 12 inches on center in field, along abutting end
8 joints.
9
- 10 3.06 JOINT TREATMENT APPLICATION
- 11
- 12 A. Mix joint compound in accordance with manufacturer's recommendations.
13
- 14 B. Apply compound in thin uniform layer to all joints, angles to be reinforced. Apply reinforcing tape
15 centered over joint, seated into compound. Follow immediately with thin skim coat or embed tape.
16 Fold and embed tape in interior angles to provide true angle.
17
- 18 C. When embedding coat is thoroughly dry, apply second coat of compound, filling board taper flush
19 with surface. Cover tape, feather out slightly beyond tape.
20
- 21 D. On joints with no taper, cover tape, feather out at least 10 inches on either side of tape.
22
- 23 E. When second coat is thoroughly dry, spread finish coat evenly over and extend slightly beyond
24 second coat. Feather to a smooth, uniform finish.
25
- 26 F. Over taped edges, do not allow finish coat to protrude beyond plane of surface. Apply finish coat to
27 cover tape, taping compound at taped angles to provide true angle.
28
- 29 G. Do not abrade adjacent face-paper surfaces.
30
- 31 3.07 FINISHING FASTENERS
- 32
- 33 A. Apply compound to fastener depressions. Follow with minimum of two additional coats leaving
34 depressions level with surface.
35
- 36 B. Do not abrade adjacent face-paper surfaces.
37
- 38 3.08 FINISHING BEAD AND TRIM
- 39
- 40 A. Mechanically fasten outside corner reinforcement per manufacturer's instructions.
41
- 42 B. Apply first coat to beads, trim. Properly feather out from ground to plane of surface. Embed
43 flanges of corner reinforcement with compound.
44
- 45 C. When embedding coat is thoroughly dry, apply second coat in same manner as first-coat, extending
46 compound slightly beyond onto face of board.
47
- 48 D. When second coat is thoroughly dry, apply finish coat extending compound slightly beyond second
49 coat, properly feathering from ground to plane of surface. Sand finish coat as necessary to provide a
50 level 4 flat smooth surface, ready for decoration.
51
- 52 E. Do not abrade adjacent face-paper surfaces.
53
- 54 3.09 ACOUSTIC SEALANT
- 55

1 A. Apply sealant at intersections of wallboard and adjacent materials to form a complete seal to air and
2 noise.

3

4 3.010 TEXTURE FINISH

5

6 A. Apply texture finish in accord with manufacturer's printed instructions.

7

8 B. Provide uniform texture over entire surface.

9

10 3.011 ADJUST AND CLEAN

11

12 A. Ridging

13 1. Sand ridges to reinforcing tape without cutting through tape.

14 2. Fill concave areas on both sides of ridge with topping compound.

15 3. After fill is dry, blend in topping compound over repaired area.

16

17 B. Fill cracks with compound and finish smooth and flush.

18

19

END OF SECTION 09 29 00

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Wall Tile
- B. Floor Tile
- C. Base Tile
- D. Transition Strips

1.03 RELATED WORK

- A. Unit Masonry: Section 04 20 00.
- B. Resilient Flooring: Section 09 65 00.
- C. Resilient Athletic Flooring: Section 09 65 66.

1.04 REFERENCES

- A. The following specifications and standards are incorporated by reference:
 - 1. Tile Council of America, Inc. - "Handbook for Ceramic Tile Installation".

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Samples for colors on 12 inch by 12 inch panels in duplicate for tile specified.
 - 2. Samples in duplicate for each different trim piece required.
 - 3. Grout samples in duplicate indicating color range anticipated, texture.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, handle, deliver and store at the job site in original unbroken containers in a manner that will avoid damage or contamination.
- B. All containers shall bear grade seals, manufacturer's name, size, color and quantities.

1.07 PROJECT CONDITIONS

- A. Set and grout tile when ambient temperature is at least 50 degrees F. and rising.

1.08 EXTRA MATERIALS

- A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Furnish one box for each type, color, pattern and size installed.

PART 2 - PRODUCTS

2.01 TILE

A. Wall tile.

1. WT-1: Porcelain Tile
 - a. RBC Tile&Stone (Virginia Tile) Champaign
 - b. Color: color to be selected from manufacturer's full range.
 - c. Sizes: 18"x36" and 6"x36".
 - d. Installation: Random staggered brickwork pattern. 6" bottom tile as base.

B. Floor tile.

1. FT-1: Porcelain Tile
 - a. RBC Tile & Stone (Virginia Tile) Backbay Collection
 - b. Color: To be selected by Architect from manufacturer's full range.
 - c. 2"x 2" Mosaic BBCH Basketweave Mosaic.
 - d. Installation: Random staggered brickwork pattern.

- C. RBC Tile & Stone (Virginia Tile) is used as the basis of design. Approved equal by Atlas Concorde, Ceasar Ceramics USA, DalTile or approved equal.

2.02 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Prepackaged dry-mortar mix containing dry, re-dispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
2. Prepackaged dry-mortar mix combined with acrylic resin liquid-latex additive.
 - a. For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

2.03 ACCESSORIES

- A. Portland Cement: ASTM C 150, type 1.

- B. Sand: ASTM C-144.

- C. Water: Clean and potable.

- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout:

1. Selection to meet per tile manufacturer's recommendation.
 - a. Bostik "Hydroment Vivid" premium grade, stain resistant cementitious grout or approved equal.
 - b. Color: To be selected by AE from manufacturer's full range of colors.

- F. Acrylic Additive: LATICRETE "1776 Grout Admix Plus"; Chargar Corporation "Acryl 60" or approved equal.

- 1 G. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation
2 provided or approved by manufacturer of tile-setting materials for installations indicated.
3
4 H. Provide other materials not specifically described but required for a complete and proper installation.
5
6 I. Transition Strips:
7
8 1. Tile to sealed concrete
9 a. Manufacturer: Schluter
10 b. Profile: Schluter – Schiene
11 c. Material: Stainless steel
12 d. Size according to materials used with approval of A/E.
13
14 2. Or approved equal.
15
16

17 PART 3 - EXECUTION

18
19 3.01 EXAMINATION

- 20
21 A. Examine surfaces where tile is to be applied and notify the Contractor of any defects.
22

23 3.02 INSTALLATION

24
25 A. General

- 26 1. Provide all proper installation methods for freezing climate.
27 2. Installation and workmanship shall be in accordance with ANSI A108.1 and as specified herein. The
28 printed instructions of the tile manufacturer and the manufacturer of proprietary mortars and grouts
29 shall be followed where applicable.
30 3. Before commencing work, establish field pattern and border line locations.
31 4. Center the work symmetrically so that no tile need be cut to less than half size.
32 5. Joints in wall tile shall be aligned vertically and horizontally; staggered joints will not be accepted.
33 6. Align joints when adjoining tiles on floor, base and trim are the same size.
34 7. Rub exposed edges smooth.
35

- 36 B. Interior Wall Tile Setting Bed: TCA W202/Tile backer board substrates - acrylic modified latex-cement
37 mortar.
38

- 39 C. Handle, store, mix and apply proprietary setting and grouting materials in compliance with the manufacturer's
40 instructions.
41

- 42 D. Extend tile work into recesses and under equipment and fixtures to form a complete covering without
43 interruptions, except as otherwise shown.
44

- 45 E. Terminate work neatly at obstructions, edges, and corners without disruption of pattern or joint alignments.
46

- 47 F. Comply with manufacturer's instructions for mixing and installation of proprietary materials.
48

- 49 G. Neutralize and seal substrates in accordance with setting bed manufacturer's instructions, where required.
50

51 H. Expansion, Control Joints

- 52 1. Extend completely through tile mortar bed. Insert preformed back-up material to provide correct
53 cavity depth for sealant.
54 2. Width of expansion, control joints: Same as tile joints.

- 1 3. Prior to grouting, keep expansion and control joints open and clean.
- 2 4. After tile is grouted and completely dry, remove temporary filler material. Brush joints clean, fill
- 3 expansion and control joints.
- 4

5 3.03 CLEANING

- 6
- 7 A. After completion, clean all work, point open joints and replace defective work.
- 8

9 3.04 PROTECTION

- 10
- 11 A. Close off work spaces to traffic during installation and at least 48 hours after completion of work.
- 12
- 13 B. Tiled vertical outside corners shall be protected with board corner strips in areas used as passageways.
- 14

15
16 END OF SECTION 09 30 00
17

SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Resilient Base.
- B. Accessories.

1.03 RELATED WORK

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

1.04 QUALITY ASSURANCE

- A. Provide each type of resilient flooring and accessories from a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
- B. Installers Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.
- C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials.
 - 1. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's technical data for each type of resilient flooring and accessory.
 - a. Data indicating adhesive and accessories meet VOC requirements.
 - 2. Manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

1.06 DELIVERY, STORAGE AND HANDLING

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

1.07 PROJECT CONDITIONS

- 1 A. Maintain minimum temperature of 65 degrees F and maximum temperature of 90 degrees F in spaces to
2 receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48
3 hours after installation. Subsequently, maintain minimum temperature of 55 degrees F in areas where work is
4 completed.
5
6 B. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning
7 installation.
8
9 C. Install resilient flooring and accessories after other finishing operations, including painting, have been
10 completed.
11
12 D. Close areas to traffic and to other work until flooring is firmly set.
13
14 E. Where solvent based adhesives are used, provide safety sparkproof fans when natural ventilation is not
15 adequate.
16

17 1.08 WARRANTY

- 18
19 A. Provide current, detailed manufacturer's warranty for each flooring product as applicable including limited
20 wear, defect and conductivity.
21
22 B. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of
23 resilient flooring products. Provide manufacturer's standard limited wear warranty/conductivity warranty as
24 specified under each product as applicable.
25

26 1.09 EXTRA MATERIALS

- 27
28 A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials
29 installed and enclosed in protective packaging with appropriate identifying labels.
30 1. Furnish one box for each type, color, pattern and size installed.
31

32 1.010 ENVIRONMENTAL REQUIREMENTS

- 33 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as
34 inside the weatherproofing system and applied on site) must not exceed the following requirements.
35 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule #
36 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
37 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on
38 October 19, 2000.
39
40

41 PART 2 - PRODUCTS

42
43 2.01 RESILIENT WALL BASE

- 44
45 A. General: Rubber, cove base, top set, roll stock.
46 1. Height: 6"
47 2. Color RB-1: To be selected by architect from manufacturer's full range.
48
49 B. Manufacturers: Armstrong or approved equal by:
50 1. Flexco.
51 2. Freudenberg Building Systems, Nora.
52 3. Johnsonite.
53 4. Roppe.

1
2 2.02 ACCESSORIES

- 3
4 A. Adhesive for Wall Base: W.W. Henry “595 Cove Base Adhesive”, zero-VOCs; W.F. Taylor “2035 Cove
5 Base Adhesive” or “2040 Premium Cove Base Adhesive”, GreenGuard certified; PL Adhesives & Sealants
6 “Cove Base Adhesive”; Bostik Findley, Durabond “D-740 Multipurpose Wall Adhesive”.
7 1. Low-VOC type: VOC content less than 100 g/l.
8
9 B. Patching, Leveling, Underlayments: The leveling materials must be portland cement based and provide a
10 minimum 3,500 PSI compressive strength (ASTM C 109) and sufficient bond to existing subfloor surface.
11 1. Ardex, Laticrete, Duralox, Mapei, or equivalent, approved by flooring manufacturer.
12

13 PART 3 - EXECUTION

14
15 3.01 EXAMINATION

- 16
17 A. The subfloor must be prepped to meet meets the requirements as described in the manufacturer’s installation
18 instructions.
19
20 B. A clean non-burnished concrete surface free from any paint, wax, oil, grease, and film forming curing
21 compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds is required. The
22 surface should not have any alkaline salts, laitance, mold, mildew, residual adhesive, chemical adhesive
23 removers or anything that may prevent appropriate products bonding to it. If not then the general contractor
24 should provide the mechanical means to remove them. This could be dustless diamond grinding (DiamaBrush),
25 bead-blast or similar with a suitable HEPA vacuum attachment. Review and comply with all relevant local,
26 state and federal regulations.
27
28 C. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the
29 manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard
30 expansion joint assembly.
31
32 D. When required, use a leveler following the manufacturers written instructions. The surface should be free
33 of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that
34 may interfere with the bond. These should be completely removed by mechanical means only. Dustless
35 diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it
36 also helps to level the concrete.
37
38

39 3.02 PREPARATION

- 40
41 A. Sand or grind subfloors to remove mortar, paint, other surface irregularities.
42
43 B. 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 C. Remove all debris, sand, and other materials which would result in lack of adhesion and/or star cracking.
47
48

49 3.03 WALL BASE INSTALLATION

- 50
51 A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where
52 base is required.
53

- 1 B. Remove adjacent existing wall base to a 90 degree corner for installation of a full wall length.
2
3 C. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials
4 with mitered or coped inside corners. Cut no shorter than full wall length.
5
6 D. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and
7 vertical surfaces.
8 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall
9 base with manufacturer's recommended adhesive filler material.
10 2. Adhesive shall cover a minimum of 90 percent of ribbed back of base.
11 3. Leave 1/4 inch uncovered space at top edge of base to prevent oozing.
12 4. Roll base firmly, roll back toward starting point.
13

14 3.04 CLEANING

- 15
16 A. Perform following operations immediately upon completion of resilient flooring.
17 1. Have the flooring cleaned no sooner than 72 hours after the installation using the method approved by
18 the manufacturer's maintenance recommendations.
19 2. Touch-up and repair any minor damage to eliminate all evidence of repair. Remove and replace work
20 which cannot be satisfactorily repaired.
21

22 3.05 PROTECTION

- 23
24 A. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's
25 directions.
26
27
28

END OF SECTION 09 65 00

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Resilient Athletic Flooring.
- B. Accessories.

1.03 RELATED WORK

- A. Selective Structure Demolition: Section 02 41 19.
- B. Resilient Wall Base: Section 09 65 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 to perform work of this section who has specialized in the installation of work similar to that required for this project within the last three (3) years 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 REFERENCES

- A. 1.2.1 ASTM International (ASTM)
 - 1. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - 2. ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.
 - 3. ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).
 - 4. ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
 - 5. ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
 - 6. ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 - 7. ASTM E1643: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

- 1 8. ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or
- 2 Granular Fill under Concrete Slabs.
- 3 9. ASTM E2180: Standard Test Method for Determining the Activity of Incorporated Antimicrobial
- 4 Agent(s) In Polymeric or Hydrophobic Materials.
- 5 10. ASTM F386: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat
- 6 Surfaces.
- 7 11. ASTM F410: Standard Test Method for Wear Layer Thickness of Resilient Floor Coverings by
- 8 Optical Measurement.
- 9 12. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- 10 13. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
- 11 14. ASTM F970: Standard Test Method for Static Load Limit.
- 12 15. ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color
- 13 Change.
- 14 16. ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color
- 15 Change.
- 16 17. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete
- 17 Subfloor Using Anhydrous Calcium Chloride.
- 18 18. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs
- 19 Using in situ Probes.
- 20

21 1.06 SUBMITTALS

- 22
- 23 A. Submit in accordance with the General Conditions of the Contract.
- 24 1. Manufacturer's technical data for each type of resilient flooring and accessory.
 - 25 a. Data indicating adhesive and accessories meet VOC requirements.
 - 26 2. Shop drawings prepared for project illustrating layouts, details, dimensions and other data.
 - 27 3. Manufacturer's standard color charts in form of actual sections of resilient flooring, including
 - 28 accessories, showing full range of colors and patterns available, for each type of resilient flooring
 - 29 required.
 - 30 4. Submit samples 6 inches X 6 inches
 - 31 5. Two copies of manufacturer's recommended maintenance practices for each type of resilient flooring
 - 32 and accessory required.
 - 33

34 1.07 DELIVERY, STORAGE AND HANDLING

- 35
- 36 A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand
- 37 names, colors and patterns, and quality designations legible and intact.
- 38
- 39 B. Store and protect materials in accordance with manufacturer's recommendations.
- 40

41 1.08 PROJECT CONDITIONS

- 42
- 43 A. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning
- 44 installation. Storage temperature must not be below 55F (13C) and must not exceed 100F (38C).
- 45
- 46 B. Install resilient flooring and accessories after other finishing operations, including painting, have been
- 47 completed.
- 48
- 49 C. Do not install resilient flooring over concrete slabs until they have been cured and are sufficiently dry to
- 50 achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and
- 51 moisture test.
- 52
- 53 D. Close areas to traffic and to other work until flooring is firmly set. Tile shall have 72 hours with no traffic.

1
2 E. Where solvent based adhesives are used, provide safety sparkproof fans when natural ventilation is not
3 adequate.

4
5 1.09 WARRANTY

6
7 A. Provide current, detailed manufacturer's warranty for each flooring product as applicable including limited
8 wear, defect and conductivity.

9
10 B. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of
11 resilient flooring products. Provide manufacturer's standard limited wear warranty/conductivity warranty as
12 specified under each product as applicable.

13
14 1.010 EXTRA MATERIALS

15
16 A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials
17 installed and enclosed in protective packaging with appropriate identifying labels.

- 18 1. Provide extra stock materials from original dye lots, for use in facility operations and maintenance
19 (not less than 2% of the total floor surface for each color, surface texture and format of Manufactured
20 Product).

21
22 1.011 ENVIRONMENTAL REQUIREMENTS

23
24 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as
25 inside the weatherproofing system and applied on site) must not exceed the following requirements.

- 26 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule #
27 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
28 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on
29 October 19, 2000.

30
31
32 PART 2 - PRODUCTS

33
34 2.01 RESILIENT ATHLETIC FLOORING

35
36 A. Basis of Design: Sport Impact Rubber Athletic Flooring

- 37 1. Thickness: 10mm
38 2. Color to be selected by architect from manufacturer's full range.
39 3. Manufactured Product must have undergone a vulcanization process; factory lamination should not be
40 accepted as equivalent.
41 4. In accordance with ASTM E648, the Manufactured Product must have a critical radiant flux
42 $\geq 0.45\text{W/cm}^2$ (Class 1).
43 5. In accordance with ASTM E662, the Manufactured Product must have an optical density of smoke
44 < 450 .

45
46 B. Manufacturers:

- 47 1. Mondo or approved equal.
48 2. Manufacturer must be certified ISO 9001.

49
50 2.02 ACCESSORIES

51
52 A. Prep existing concrete floor for installation, Patching or leveling compound, slab primer to be supplied or
53 recommended/approved by Manufacturer.

- 1 B. Adhesives: Provide adhesive certified by Manufacturer: Mondo, low-VOC type per Manufacturer's
2 guidelines.
3
4

5 PART 3 - EXECUTION
6

7 3.01 EXAMINATION
8

- 9 A. Ensure that concrete subfloors, on or below grade, are installed over a permanent effective vapor retarder,
10 respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745.
11 The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per
12 Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a
13 minimum thickness of 10 mil (0.010in).
14 B. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of
15 concrete subfloor (normal density concrete curing time is approximately 28 days for development of design
16 strength). Refer to current version of ASTM F710.
17 C. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete.
18 D. Prep subfloor surface so that it is free of any paint, wax, oil, grease, sealer, curing compound, solvent or any
19 other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical
20 abatement. Use of abatement chemicals is not recommended.
21 E. Finish concrete to have a smooth, dense finish, and is highly compacted with a tolerance of 1/8" in a 10ft
22 radius (3.2mm in 3.05m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.
23 F. Perform moisture and alkalinity tests must on all concrete substrates, under in-service conditions. It is
24 recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing
25 conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of
26 the concrete slab must not exceed 85%, in accordance with ASTM F2170 (in situ probes). Moisture vapor
27 emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with
28 ASTM F1869 (anhydrous calcium chloride).
29 G. Maintain a stable room and subfloor temperature within the recommended range of 65oF to 86oF (18oC to
30 30oC), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended
31 ambient humidity control level is between 35 to 55%.
32 H. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the
33 manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard
34 expansion joint assembly.
35 I. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only
36 use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a
37 residue that may interfere with the adhesive bond.
38 I. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory. Indicate adverse
39 conditions of any type by letter.
40

41 3.02 PREPARATION
42

- 43 A. The subfloor must be prepped to meet the Manufacturer's current printed guidelines.
44

45 3.03 INSTALLATION
46

- 47 A. Install tiles of resilient athletic flooring following Manufacturer's current printed guidelines.
48 B. Install all accessories following Manufacturer's current printed guidelines.
49

50 3.04 REPAIR
51

- 52 A. Repair material must come from the same original dye lot as the Manufactured Product initially installed.
53 B. Repairs are to be performed by qualified installers/technicians only.

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3.05 CLEANING

- A. Wait at least a minimum of 72 hours after the resilient athletic flooring has been completely installed before performing initial maintenance meeting current Manufacturer's printed guidelines.

3.06 PROTECTION

- A. Protect resilient athletic flooring with 1/8" Masonite during and after the installation, prior to acceptance by the Owner.

END OF SECTION 09 65 00

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SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Painting and finishing of interior exposed items and surfaces throughout Project that have already been painted.
- B. Refinishing of existing surfaces as indicated on Drawings, including removal of paint and finishes, preparation, painting and finishing.
- C. Field painting of previously painted pipes and ducts and hangers, conduits, uni-strut, exposed steel and iron work, all metal fabricated Section 05 50 00 items, and primed metal surfaces including but not limited to, hollow metal work, equipment installed under mechanical and electrical work.
- D. "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied material whether used as prime, intermediate or finish coats.
- E. Except where natural finish or existing 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 to the public.
 3. Finished Metal Surfaces.
 4. Operating Parts.

1.03 RELATED WORK

- A. Examine the Contract Documents and be familiar with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other Sections shall be painted or finished as part of this Section.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract:
1. 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
2 submit two approximately 6 inch square, properly labeled samples of each color and
3 sheen required 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. Prior to contractor starting to apply any material covered in this section, there shall be a pre-
14 installation meeting with the Owner, Architect, subcontractor and material suppliers to review
15 mockups, surface condition, surface preparation, material application and inspection procedures.
16
17 B. MPI Standards:
18 1. Products: Complying with MPI standards indicated and listed in "MPI Approved
19 Products List."
20
21 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural
22 Painting Specification Manual" for products and paint systems indicated.
23 a. For areas to be renovated, comply with requirements in "MPI Maintenance
24 Repainting Manual".

25
26 1.06 DELIVERY, STORAGE AND HANDLING

- 27
28 A. Do not deliver materials to site until having received all written approvals of submitted
29 information and samples.
30
31 B. Deliver materials to job site in original, new and unopened packages and containers bearing
32 manufacturer's name and label.
33
34 C. Store materials not in actual use in tightly covered containers.
35
36 D. Take all precautions to ensure that workers and work areas are adequately protected from fire
37 hazards and health hazards resulting from handling, mixing and application of paints.
38
39 E. Remove rags and waste from storage areas daily.

40
41 1.07 PROJECT CONDITIONS

- 42
43 A. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air
44 temperatures are between 50 and 95 degrees F.
45
46 B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding
47 air temperatures are between 45 degrees F. and 95 degrees F.
48
49 C. Do not apply paint when relative humidity exceeds 85%; at temperatures less than 5 degrees F.
50 above the dew point; or to damp or wet surfaces.

51
52 1.08 SEQUENCING AND SCHEDULING

- 53
54 A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto
55 newly-painted surfaces.

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1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 2 gallons 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. Provide products from the following manufacturers:
 - 1. AFM Safecoat
 - 2. Benjamin Moore & Co.
 - 3. Cabot
 - 4. ICI/Dulux.
 - 5. Mythic Paint, Southern Diversified Products
 - 6. PPG Architectural Finishes, Inc.
 - 7. Rymar, LLC
 - 8. Sherwin-Williams Company
 - 9. Sikkens
 - 10. Target Coatings
 - 11. Diamond Vogel Paint

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

1 selection. Any manufacturer noted above may be used as long as quality and color requirements
2 are met.

- 3
4 1. Proprietary names used to designate colors or materials are not intended to imply that
5 products of named manufacturers are required to exclusion of equivalent products of
6 other manufacturers.

7
8 C. Provide best quality grade of various types of coatings as regularly manufactured by acceptable
9 paint materials manufacturers.

10
11 D. Material Compatibility:

- 12
13 1. Provide materials for use within each paint system that are compatible with one another
14 and substrates indicated, under conditions of service and application as demonstrated by
15 manufacturer, based on testing and field experience.
16
17 2. For each coat in a paint system, provide products recommended in writing by
18 manufacturers of topcoat for use in paint system and on substrate indicated.

19
20 E. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that
21 comply with the following limits for VOC content, exclusive of colorants added to a tint base,
22 when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following
23 chemical restrictions; these requirements do not apply to primers or finishes that are applied in a
24 fabrication or finishing shop:

- 25
26 1. Primer or Undercoat: VOC content of not more than 100 g/L (150 g/L with colorant
27 added at point-of-sale).
28 2. Flat Paints and Coatings: VOC content of not more than 50 g/L (100 g/L with colorant
29 added at point-of-sale).
30 3. Non-flat Paints and Coatings: VOC content of not more than 100 g/L (150 g/L with
31 colorant added at point-of-sale).
32 4. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by
33 weight of total aromatic compounds (hydrocarbon compounds containing one or more
34 benzene rings).
35 5. Restricted Components: Paints and coatings shall not contain any of the following:
36
37 a. Acrolein.
38 b. Acrylonitrile.
39 c. Antimony.
40 d. Benzene.
41 e. Butyl benzyl phthalate.
42 f. Cadmium.
43 g. Di (2-ethylhexyl) phthalate.
44 h. Di-n-butyl phthalate.
45 i. Di-n-octyl phthalate.
46 j. 1,2-dichlorobenzene.
47 k. Diethyl phthalate.
48 l. Dimethyl phthalate.
49 m. Ethylbenzene.
50 n. Formaldehyde.
51 o. Hexavalent chromium.
52 p. Isophorone.
53 q. Lead.
54 r. Mercury.
55 s. Methyl ethyl ketone.

- 1 t. Methyl isobutyl ketone.
- 2 u. Methylene chloride.
- 3 v. Naphthalene.
- 4 w. Toluene (methylbenzene).
- 5 x. 1,1,1-trichloroethane.
- 6 y. Vinyl chloride.

7

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

9

10 2.03 EQUIPMENT

11

12 A. Provide all brushes, rollers, ladders, scaffolding, and other equipment of any kind to properly

13 execute each type of work.

14

15 PART 3 - EXECUTION

16

17 3.01 EXAMINATION

18

19 A. Examine substrates and conditions, with Applicator present, for compliance with requirements

20 for maximum moisture content and other conditions affecting performance of work.

21

22 B. Maximum Moisture Content of Substrates:

- 23 1. Gypsum Board: 12 percent.
 - 24 2. Concrete: Must be cured a minimum of 45 days.
- 25

26 C. Verify suitability of substrates, including surface conditions and compatibility with existing

27 finishes and primers.

28

29 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces

30 are dry.

- 31 1. Beginning coating application constitutes Contractor's acceptance of substrates and
 - 32 conditions.
- 33

34 3.02 PREPARATION

35

36 A. Perform preparation and cleaning procedures in accord with paint manufacturer's instructions

37 and as specified for each particular substrate condition.

38

39 1. Remove signage and room number stickers, hardware, hardware accessories, machined

40 surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted,

41 or provide surface-applied protection prior to surface preparation and painting operations.

42 Coordinate with Owner prior to removal as facility will remain occupied.

43 a. After completing painting operations, use workers skilled in the trades involved to

44 reinstall items that were removed. Remove surface-applied protection if any.

45 b. Do not paint over labels of independent testing agencies or equipment name,

46 identification, performance rating, or nomenclature plates.

47 2. Remove existing coatings that exhibit loose surface defects and sand to a sound surface.

48 3. Glossy surfaces should be sanded dull or tested with an abrasive cleaner that will sand

49 and dull in one operation.

50 4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and

51 grease prior to mechanical cleaning.

52 5. Spot prime any bare areas with an appropriate primer. Ensure finishing of surfaces with

53 repaired plaster achieves a uniform appearance to the next 90 degree corner and substrate

54 is ready to receive paint.

- 1 6. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental
2 to formation of a durable paint film.
3
4 B. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level
5 surfaces taking care not to raise nap of paper.
6
7 C. Existing Ferrous Metal
8 1. Spot remove failed, damaged or rough existing paint to bare metal. If existing metal
9 surface is not smooth, sand or wire brush.
10 a. Sand edges of existing paint to a feather edge.
11 2. Remove dirt and grease with mineral spirits or solvent recommended by paint
12 manufacturer and clean cloths.
13

14 3.03 APPLICATION

- 15
16 A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to
17 disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
18
19 B. Do no interior work until building is properly enclosed.
20
21 C. Do work under adequate illumination and dust-free conditions.
22
23 D. Apply paints according to manufacturer's written instructions.
24 1. Use applicators and techniques suited for paint and substrate indicated.
25 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
26 3. Paint front and backsides of access panels, removable or hinged covers, and similar
27 hinged items to match exposed surfaces.
28
29 E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of
30 same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient
31 difference in shade of undercoats to distinguish each separate coat.
32
33 F. Materials
34 1. Do not open containers until required for use.
35 2. Stir materials thoroughly and keep at uniform consistency during application.
36
37 G. Coats
38 1. Number specified is minimum.
39 2. Touch up suction spots between coats.
40 3. If undercoats or other conditions show through topcoat, apply additional coats until cured
41 film has a uniform paint finish, color, and appearance.
42 4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush
43 marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp
44 lines and color breaks.
45 5. Refinish surfaces affected by refitting work.
46

47 3.04 COLOR SEPARATION

- 48
49 A. An average of one or two wall colors will be used per room. Ceilings generally will be a
50 different color than walls.
51
52 B. Job painted metal items such as diffusers, grilles and registers will generally be same color as
53 adjacent surface.
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55 3.05 CLEANING

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

3.06 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct damage by cleaning, repairing or replacing.
- B. Provide "wet paint" signs to protect newly-painted finishes. Remove temporary protective wrappings, after completion of painting operations.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.07 SCHEDULE OF INTERIOR WORK

- A. In addition to obvious surfaces, the following do not require painting or finishing.
 1. Do not paint previously unpainted concrete.
 2. Do not paint existing full wall advertising graphic panels.
 3. Do not paint laminate panels above and below concessions windows.
 4. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts or faces of doors not exposed to the Concourse when closed.
 5. Glazing or metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated. Do not paint factory finished overhead coiling grilles, overhead doors or accordion partitions. Only paint where previously field painted to match walls.
 6. Do not paint previously unpainted horizontal wall guards.
 7. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
 8. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plate.
 9. N/A indicates system not applicable to this Project.
- B. Walls and Ceilings
 1. Paint all rooms. Paint patched walls from 90 degree corner or vertical expansion joint cover in corridors, and patched ceilings complete.
 2. Do not apply next coat until previous is thoroughly dry.
 3. Provide final coat which is solid and even in color, free from runs, laps, sags, brush marks, air bubbles and excessive roller stipple and worked into crevices, joints and similar areas.
- C. Electrical Panel Box Covers and Doors
 1. Remove, paint and reinstall after paint is dry.
- D. Other Unfinished and Primed Surfaces
 1. Provide specified finish on exposed surfaces. This includes prime coated mechanical units, piping, pipe covering, conduit, and interior duct surfaces visible behind grilles.

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E. Interior Paint Schedule

System	Material	Type/Sheen	Number and Type of Coating
IPS-5	Plaster	Water based Acrylic Epoxy / Eg-shel	Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy"
IPS-7	Gypsum Board	Water based Acrylic Epoxy / Eg-shel	Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy"
IPS-8	Concrete	Water based Acrylic Epoxy / Eg-shel	Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy"
IPS-9	Concrete Masonry	Water based Acrylic Epoxy / Eg-shel	Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy"
IPS-14	Ferrous Metal (Primed)	Acrylic/Semi-gloss	Two coats "Pro Industrial DTM Acrylic"
IPS-15	Copper/Aluminum (finished rooms only)	Acrylic/Eg-shel	Two coats "Pro Industrial DTM Acrylic"
IPS-16	Galvanized Metal (finished rooms only)	Acrylic/Eg-shel	Two coats "Pro Industrial DTM Acrylic"
IPS-20	Storefront Infill Panels, Operable Partition Panels, Wall Tile, Corner Guards	Acrylic/Eg-shel	One coat Extreme Bond Primer Two coats "Pro Industrial DTM Acrylic"

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3.08 SCHEDULE OF EXTERIOR WORK

A. NA

3.09 PAINT COLOR SCHEDULE

- A. PT-1: Field (to be selected)
- B. PT-2: Field Concourse (to be selected)
- C. PT-3: Accent (to be selected)
- D. PT-4: Field (to be selected)
- E. PT-5: Concrete Ceiling (to be selected)
- F. PT- 6: HM Doors and Frames (to be selected)
- G. PT-11: Exposed ductwork

END OF SECTION

SECTION 10 10 00

VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 01 81 13, Sustainable Design Requirements.

1.03 WORK INCLUDED

- A. Porcelain White Boards (White Board - WB)

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the contract.
 - 1. Product Data: Manufacturer's catalog information edited to indicate specific products and related accessories to be provided for this Project.
- B. Submit samples of each material to be used.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver board products only when dry, warm storage space is available at the Project Site.
- B. Acclimatize all board products within the area of installation for a minimum of 72 hours at a temperature of 70 degrees F. before commencement of installation work, during the installation period, and for 48 hours after completion of the installation.

1.06 ENVIRONMENTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.01 PORCELAIN WHITE BOARDS

- A. Porcelain Steel, custom sizes and locations as noted on drawings.
 - 1. Manufacturer:
 - a. US Markerboard
 - b. Quartet Manufacturing Company
 - c. Or approved equal

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- 2. Frame Type:
 - a. Aluminum

- 3. Marker Tray:
 - a. Aluminum
 - b. Full Length

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Substrate surfaces shall be clean, dry and free from loose materials. Prime or size and back-up surfaces as recommended by manufacturer.

- B. Install board products in locations and at height as shown on Project Drawings unless otherwise directed by the Architect. All board panels shall be one piece without joints.

3.02 TRIM

- A. Miter trim at all corners. Joints shall be hairline, smooth and in full continuous contact. Do not splice trim sections except in lengths over 24 feet.

- B. Provide the specified accessories, installed and operable on trim sections indicated.

- C. Leave installation clean, undamaged and ready for use by the Owner.

END SECTION 10 10 00

SECTION 10 14 00

INFORMATION SPECIALTIES

PART 1:GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Accessibility Signage.

1.03 REFERENCES

- A. All signage shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's Literature: Graphics with text, materials description, colors, and application instructions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide protective coverings for identifying devices prior to shipping.
- B. Handle and store to prevent damage and soiling.

PART 2:PRODUCTS

2.01 ADA REQUIRED ACCESSIBILITY SIGNAGE

- A. All interior signage must have tactile/Braille lettering and raised pictograms. Braille must be integral to the sign. Taped on Braille is not acceptable.
 - 1. All Braille to be located at the bottom of the sign.
 - 2. When the word "accessible" is used on a sign or when the symbol for accessibility is used, the word accessible must be included in the Braille text.
- B. Exterior Signs
 - 1. All Braille to be located at the bottom of the sign.
 - 2. When the word "accessible" is used on a sign or when the symbol for accessibility is used, the word accessible must be included in the Braille text.
 - 3. Size: Approximately 6" x 10".
 - 4. Material: Plastic for exterior use.
 - 5. Color: As selected by Architect from manufacturer's full range.
- C. Manufacturers
 - 1. ASI Sign Systems.
 - 2. Poblocki Sign Company
 - 3. Best Sign Systems Inc.
 - 4. 2/90 Sign Systems

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5. Or approved equal.

- D. Provide proper gender symbol at each door leading to a room designed for handicap use (i.e., toilet rooms with grab bars, etc.).

PART 3:EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for the installation of identification devices.
- C. Install devices plumb, level and true to line.
- D. Install room and door identification signs at 5 feet from centerline of signs to finished floor.
 - 1. When used in conjunction with accessibility symbol, mount below symbol.

3.02CLEANING

- A. Clean surfaces of identifying devices, dedication plaque and surrounding surfaces.
- B. Remove protective coatings, if any.

3.03SIGNAGE SCHEDULE

- A. ADA Signage to be provided at each locker room entrance and each shower stall. Provide ADA accessible symbol.

END OF SECTION 10 14 00

SECTION 10 21 13

TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 RELATED WORK

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

1.02 WORK INCLUDED

- A. Solid Plastic Toilet Partition Doors and Urinal Screens – all components are ceiling or wall mounted to masonry
- B. Attachment hardware.

1.03 RELATED WORK

Metal Fabrications: Section 05 50 00.

- A. Toilet, Bath and Laundry Accessories: Section 10 28 00.

1.04 REFERENCES

- A. All work shall be in strict accord with Wisconsin Enrolled Commercial Building Code.
- B. ANSI A117.1 – Accessible and Usable Buildings and Facilities.
- C. ADAAG – Americans with Disabilities Act for Accessibility Guidelines.
- D. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Shop drawings showing scale, drawings of plan, all elevations of all compartments, indicate clearly the hardware, and accessories to be furnished.
 - 2. Verify field dimensions.
 - 3. Part of the submittal may consist of standard brochures.
 - 4. Shop drawings that clearly show attachment locations for all blocking and anchorages.
 - 5. Shop drawings that show locations and drilling dimensions.
 - 6. Two sets of color samples.
 - 7. Minimum warranty: 15 year HDPE warranty against material defect, 10 year hardware manufacturer product guarantee. 3 year warranty against fabrications defects including labor to remove or re-install replacements.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver compartments in suitable crating or packaging to prevent damage in transit and storage.
- B. Coordinate delivery with progress schedule to reduce period of on-site storage. Store under cover in a dry area.

1.07 FIELD MEASUREMENTS

- 1
2 A. Verify field measurements are as shown on Drawings, shop drawings and as instructed by the
3 manufacturer.

4
5 PART 2 - PRODUCTS

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7 2.01 TOILET PARTITIONS

- 8
9 A. Solid Plastic Toilet Partitions
10 1. Best Specialties: Waukesha Solid Partition
11 2. Champion Partitions
12 3. Ampco Products, Inc.
13 4. American Building Specialties Corp.
14 5. ASI Accurate Partitions, Ultimate Privacy.
15 6. Or approved equal.

16
17 2.02 FEATURES

- 18
19 A. Material: HDPE High Density Polyethylene
20 1. Color: to be selected from manufacturer's full range.
21 2. Minimum 30% post-consumer recycled content.
22 3. Free of added Urea Formaldehyde Resins.
23
24 B. Fasteners, Anchorages: Manufacturer's standard stainless steel to accommodate solid surface.
25 1. Through bolts and nuts, stainless steel with tamperproof heads.
26
27 C. Hardware: Material: Stainless steel, complying with ADA standards.
28 1. Hinges: Bathroom Stall Full Length Stainless Steel Continuous self closing hinges that can
29 be adjusted to hold door open in any position. 54 1/2" 1/4" Pin. 14 Gauge. Adjustable or
30 doors to be in the closed position for outswing compartments in the rest position. Inswing
31 doors shall remain at 20 degrees in rest position.
32 2. Coat Hook: Combination hook and rubber tipped bumper, sized to prevent door from hitting
33 accessories or wall.
34 3. Latch and keeper: Toilet Partition Stainless Steel ADA Throw Latch 3 1/2" Screws. 4 1/2" x 1
35 1/2" x 3/16" base. Provide keeper with stops for throw latch coordinated with each stall
36 configuration.
37 4. Stainless steel pulls where required for operation.
38 5. Door bumper: Rubber tipped as needed at out swinging doors.

39
40 2.03 FABRICATION

- 41
42 A. Doors and urinal screens: Solid Plastic wall mounted.

43
44 2.04 FINISHES

- 45
46 A. Finish color and pattern selected by A/E from manufacturer's full range. Color to match existing
47 partitions: Slate.
48
49 B. Stainless Steel: No. 4 polished finish on all exposed hardware.

50
51 PART 3 - EXECUTION

52
53 3.01 INSTALLATION

- 54
55 A. Installation of all doors and screens shall be done in compliance with manufacturer's instructions and
56 approved shop drawings.

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B. Evidence of drilling in walls shall be concealed in the finished work.

C. Install partition components secure, plumb and level.

D. Attach panels and pilasters to brackets with through bolts and nuts.

E. Provide 1/2 inch space between wall surface and panels.

3.02 CLEANING

A. Remove all protective maskings and clean surfaces. Leave them free of soil and imperfections.

3.03 PROTECTION

A. Field touch-up of finished surfaces will not be permitted. Replace damaged components.

END OF SECTION 10 21 13

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SECTION 10 28 00

TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Commercial Toilet and Bath Accessories

1.03 REFERENCES

- A. All work of this section shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's product data.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packaging with seals unbroken and bearing manufacturer's name and product.
- B. Store all materials in secure place to prevent damage.
- C. Remove all damaged materials from project immediately.

1.06 SUSTAINABLE DESIGN REQUIREMENTS

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

PART 2 - PRODUCTS

2.01 MANUFACTURED COMMERCIAL UNITS

- A. Grab Bars:
 - 1. Bradley Model 812
 - 1. Or approved equal
 - 2. 1-1/2" diameter, 18 gauge, type 304 stainless steel
 - 3. Concealed-mounting
 - 4. Lengths as indicated on drawings
- B. Toilet Tissue (Roll) Dispenser:

- 1 1. Owner Furnished Contractor Installed at each water closet
- 2
- 3 C. Recessed Shelf
- 4 1. American Specialties ASI0412
- 5 2. 8"x18" recess stainless steel
- 6 3. Location to be provided by AE
- 7 4. Install (1) in each shower
- 8
- 9 D. Soap Dispenser:
- 10 1. O.F.C.I. wall mounted adjacent to each lav faucet.
- 11 2. County to provide prior to lav rough in.
- 12
- 13 E. Warm-Air Dryers (DRYER):
- 14 1. Xlerator Hand Dryer
- 15 1. Or approved equal
- 16 2. Noise Reduction Nozzle
- 17 3. ADA Compliant Projection
- 18 4. Surface recessed
- 19 5. Operation: Electronic-sensor activated with timed power cut-off switch
- 20 1. Operation Time: 10 to 15 seconds
- 21 6. Cover Material and Finish: Steel, with black graphite epoxy finish
- 22 7. Electrical Requirements
- 23 1. 120 V, 13 A, 1500 W
- 24 2. Each hand dryer shall have a dedicated 20amp circuit
- 25
- 26 F. Napkin disposal/shelf
- 27 1. Bradley 4791-15
- 28 2. Surface mounted
- 29 3. Satin Finish Stainless Steel
- 30 4. Install in each stall, confirm with Owner prior to submittal
- 31
- 32 G. Mirrors:
- 33 1. Bradley Channel Frame Mirror
- 34 1. Or approved equal
- 35 2. Stainless steel framed
- 36 3. Size: 18" x 60"
- 37
- 38 H. Clothes Hook Wall (CHW) see 4A701
- 39 1. Stainless Steel Richelieu 51128170
- 40 2. Or approved equal
- 41 3. See drawings for locations.
- 42 4. Install (1) at each sink, location to be provided by architect.
- 43 5. Install (2) at each shower, see elevation.
- 44
- 45 I. Coat Hook see 3A701 referencing 6A850
- 46 1. Brushed Nickle Richelieu 1223011195, 20 lb capacity
- 47 2. See drawings for locations (2) per locker support bracket.
- 48 3. Provide stainless steel through bolt hardware and coordinate with 05 50 00 shop drawings.
- 49
- 50 J. Folding Shower Seat (FSS)
- 51 1. Bobrick solid phenolic folding shower seat B-5192
- 52 2. Install in each shower stall, confirm with Owner prior to submittal.
- 53
- 54 K. Anti-Ligature Shower Curtain, Track and Carrier
- 55 1. Cape Cod Systems Breakaway Shower Curtains
- 56 2. Mesh – Sure-Check, color to be selected by A/E from manufacturers full range
- 57 3. Optitrack cubical curtain track system
- 58 4. Optitrack Pop Out Carrier, CCSCE6026
- 59 5. Install (1) at each shower stall

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2.02 SEALANT

- A. "G-E silicone sealant", General Electric Company.
- B. "Dow Corning 780", Dow Corning Corporation.
- C. "Pecora 826", Pecora Chemical Corporation.

2.03 FASTENERS

- A. Provide all fastening devices including screws, bolts, anchors, and backplates.
- B. Exposed fasteners shall match finish of accessories.

2.04 FABRICATION

- A. Fabricate all toilet and bath accessories of type 302 or 304 stainless steel with satin finish, unless otherwise specified or approved.
- B. All accessories shall be by one manufacturer unless otherwise specified or approved.
- C. Manufacturer's labels or imprinted name shall not be visible.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and recesses to receive toilet and bath accessories for dimensions, plumbness, blocking, and other conditions that affect installation.
- B. Do not proceed until conditions are acceptable.

3.02 INSTALLATION

- A. Install toilet and bath accessories according to manufacturer's direction.
- B. All accessories in any one space shall be of matching design and finish. If discrepancies are found, secure Architect's approval before proceeding.
- C. Set all recessed and semi-recessed accessories with continuous seal of sealant, around entire perimeter of all accessories to prevent moisture from reaching substrate.

3.03 ADJUSTING AND CLEANING

- A. Adjust accessories for proper operation.
- B. Replace damaged or defective items.
- C. Clean and polish accessories after removing labels and protective wrapping.
- D. Delivery accessory keys, service, and parts manual in accordance with the General Conditions of the Contract Closeout.

3.04 SCHEDULE

- A. Provide accessories as indicated on the drawings or specification.

END OF SECTION

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

PART 1 - GENERAL

SCOPE

This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 – GENERAL

- Scope
- Related Work
- Regulatory Requirements
- Reference Standards
- Quality Assurance
- Abbreviations and Symbols
- Definitions
- Coordination
- Electronic Drawings
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sealing and Firestopping
- Off Site Storage
- Submittals
- Specified Materials and Equipment
- Equipment Installation
- Operating and Maintenance Manuals
- Record Drawings
- Testing
- Cleaning
- Warranty
- Certified Startup Reports

PART 2 - PRODUCTS

- Electrical Requirements
- Access Panels and Doors
- Pipe Penetrations
- Equipment, Piping, and Valve Identification
- Equipment Accessories
- Gauges
- Bedding and Backfill

PART 3 - EXECUTION

- General
- Asbestos Abatement
- Demolition
- Excavation and Backfill
- Rock Excavation
- Surface Restoration
- Concrete Work
- Openings, Cutting and Patching
- Building Access
- Equipment Access
- Coordination of Work

- 1 Piping Installation
- 2 Sleeves
- 3 Pipe Penetrations
- 4 Escutcheon Plates
- 5 Painting
- 6 Identification

7

8 **RELATED WORK**

9 Applicable provisions of Division 01 govern work under this Section.

10

11 This section applies to all Division 22 sections of plumbing.

12

13 **REGULATORY REQUIREMENTS**

14 **Codes and Standards:**

15 All plumbing work shall conform to the requirements of Wisconsin Administrative Code SPS 382
16 and SPS 384, Wisconsin Uniform Plumbing Code.

17

18 All materials and workmanship shall comply with applicable Codes, local ordinances, industry
19 standards and utility regulations. In case of differences between such Codes, and the Contract
20 Documents, the most stringent shall govern. Promptly notify the A/E in writing of any such
21 difference.

22

23 **Non-Compliance:**

24 Should the Contractor perform any work that does not comply with the above requirements, without
25 having notified the A/E, he shall bear all costs necessary to correct the deficiencies.

26

27 **Permits, Inspections and Fees:**

28 All required, permits, and inspections shall be requested and obtained by the Contractor.

29

30 All fees and charges for approvals, reviews, or other inspections shall be paid by the Contractor.

31

32 All fees and charges assessed by local utilities for water, sewer, gas or other services shall be
33 included in the bid and shall be paid by the Contractor(s).

34

35 **REFERENCE STANDARDS**

36 Standards cited in the Specifications shall be the most recent editions.

37

38 Abbreviations of standards organizations referenced in this and other sections are as follows:

- 39 ABMA American Boiler Manufacturers Association
- 40 ACPA American Concrete Pipe Association
- 41 AGA American Gas Association
- 42 AMCA Air Movement and Control Association
- 43 ANSI American National Standards Institute
- 44 ARI Air Conditioning and Refrigeration Institute
- 45 ASME American Society of Mechanical Engineers
- 46 ASPE American society of Plumbing Engineers
- 47 ASSE American Society of Sanitary Engineering
- 48 ASTM American Society for Testing and Materials
- 49 AWWA American Water Works Association
- 50 AWS American Welding Society
- 51 CISPI Cast Iron Soil Pipe Institute
- 52 CGA Compressed Gas Association
- 53 CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service,
54 NBS
- 55 EPA Environmental Protection Agency
- 56 FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office

- 1 GAMA Gas Appliance Manufacturers Association
- 2 IAPMO International Association of Plumbing & Mechanical Officials
- 3 IEEE Institute of Electrical and Electronics Engineers
- 4 ISA Instrument Society of America
- 5 MCA Mechanical Contractors Association
- 6 MICA Midwest Insulation Contractors Association
- 7 MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
- 8 NBS National Bureau of Standards
- 9 NEC National Electric Code
- 10 NEMA National Electrical Manufacturers Association
- 11 NFPA National Fire Protection Association
- 12 NSF National Sanitation Foundation
- 13 PDI Plumbing and Drainage Institute
- 14 SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
- 15 STI Steel Tank Institute
- 16 UL Underwriters Laboratories Inc.

17

18 Standards referenced in this section:

- 19 ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete
- 20 ASTM D1557 Standard Test Method for Moisture-Density Relations of Soils
- 21 ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- 22 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- 23 D.OT. Standard Specifications for Road and Bridge Construction, State of Wisconsin,
24 Dept. of Transportation
- 25 UL1479 Fire Tests of Through-Penetration Firestops
- 26 UL723 Surface Burning Characteristics of Building Materials

27

28 **QUALITY ASSURANCE**

29

30 All products and materials used are to be new, undamaged, clean and in good condition. Existing
31 products and materials are not to be reused unless specifically indicated.

32

33 Where equipment or accessories are used which differ in arrangement, configuration, dimensions,
34 ratings, or engineering parameters from those indicated on the contract documents, the contractor
35 is responsible for all costs involved in integrating the equipment or accessories into the system and
36 for obtaining the intended performance from the system into which these items are placed.

37

38 **ABBREVIATIONS AND SYMBOLS**

39 Key to abbreviations and symbols shall be on the Drawings.

40

41 The following are additional abbreviations used in the Specifications:

- 42 A/E Architect/Engineer
- 43 GC General Contractor
- 44 PC Plumbing Contractor
- 45 FPC Fire Protection Contractor
- 46 HC Heating Ventilating and Air Conditioning Contractor
- 47 EC Electrical Contractor

48

49 **DEFINITIONS**

50 **Furnish:**

51 Supply and deliver to Project site ready for unpacking, assembly and installation.

52

53 **Install:**

54 Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying,
55 finishing, cleaning, and connecting related devices required for product fully functional for intended
56 use after installation.

1 **Provide:**

2 Furnish and install, such that product is fully functional for intended use.

3
4 **COORDINATION**

5 The Drawings show the general arrangement of piping and equipment and shall be followed as
6 closely as actual building construction and the work of other trades permits. Architectural and
7 Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible
8 to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting
9 the Work and arrange accordingly, providing offsets, fittings and accessories as may be required
10 to meet conditions.

11
12 **ELECTRONIC DRAWINGS**

13 Drawings in electronic format will be made available to successful Plumbing contractor at a non-
14 refundable cost specified under Division 01 of Specifications. If no cost is specified in Division 01,
15 default cost shall be \$75 per drawing. Drawings provided may or may not be updated to reflect
16 Addenda items. Use of Drawings is limited to this Project and may not be forwarded to any other
17 party for any purpose. Use of files will be at Contractor's sole risk and without liability or legal
18 exposure to JDR Engineering, Inc or its employees. Architectural drawings or any other drawings
19 not produced by JDR Engineering will not be provided.

20
21 Drawings in electronic format will not be made available to successful contractor for this project.

22
23 **CONTINUITY OF EXISTING SERVICES**

24 Refer to Division 01 of the Project Manual.

25
26 Do not interrupt or change existing services without prior approval from Owner, Architect, Engineer
27 or Construction Manager. When interruption is required, coordinate down-time with Owner to
28 reduce disruption to activities. Scope of Work is indicated on Contract Documents or described
29 herein. Unless specifically stated, any work involved in interrupting or changing existing services is
30 to be done during normal working hours.

31
32 **PROTECTION OF FINISHED SURFACES**

33 Refer to Division 01 of the Project Manual.

34
35 Furnish one can of touch-up paint for each different color factory finish to be finished surface of
36 product. Deliver touch-up paint with other "loose and detachable parts" as covered in General
37 Requirements.

38
39 **SEALING AND FIRESTOPPING**

40 Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural
41 opening shall be the responsibility of the contractor whose work penetrates the opening. The
42 contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing.
43 These individuals hired shall normally and routinely be employed in the sealing and fireproofing
44 occupation.

45
46 **OFF SITE STORAGE**

47 Refer to Division 01 of the Project Manual.

48
49 **SUBMITTALS**

50 Refer to Division 01, of the Project Manual.

51
52 Submit shop drawings with space for approval stamps of GC and A/E.

53
54 Submit the following plumbing system data sheet for approval by the GC and A/E. List piping
55 material type for each piping service on the project, ASTM number, schedule or pressure class,

1 joint type, manufacturer and model number where appropriate. List valves and specialties for each
2 piping service, fixture and equipment with manufacturer and model number.

3
4 **PLUMBING SYSTEM DATA SHEET**

5 Item Pipe Service/Sizes Manufacturer/Model No. Remarks

6 Pipe

7 Fittings

8 Unions

9 Valves:

10 Ball

11 Butterfly

12 Balancing

13 Check

14

15 Pipe Specialties:

16 Building Penetrations

17

18 Hangers & Supports

19 Insulation

20 Plbg. Specialties:

21 Floor/Roof Drains

22 Cleanouts

23 Water Hammer Arrestors

24 Backflow Preventers

25

26 Plbg. Fixtures:

27 Lavatory

28 Faucet

29 Stop/Supplies

30 Waste/Trap

31

32 Submit manufacturer's color charts where finish color is specified to be selected by

33 Architect/Engineer.

34

35 Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a

36 material index list page showing item designation, manufacturer and additional items supplied with

37 the installation. Submit for all equipment and systems as indicated in the respective specification

38 sections, marking each submittal with that specification section number. Mark general catalog

39 sheets and drawings to indicate specific items being submitted and proper identification of

40 equipment by name and/or number, as indicated in the contract documents. Include wiring

41 diagrams of electrically powered equipment.

42

43 Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:

44 • Operating and Maintenance Manuals 2 copies

45 • Architect/Engineer 2 copies

46 • Local Fire Chief or Marshal 1 copy

47

48 **Firestop Systems:**

49 Contractor shall submit product data for each firestop system. Submittals shall include product

50 characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and

51 procedures for each method of installation applicable to this project. For non-standard conditions

52 where no UL tested system exists, submit manufacturer's drawings for UL system with known

53 performance for which an engineering judgement can be based upon.

54

1 **SPECIFIED MATERIALS AND EQUIPMENT**

2 Design is based on equipment specified by manufacturer and model number as specified on
3 Drawing Schedules. Where certain items are specified by manufacturer or trade name, Contractor's
4 bid shall be based on use of named item. Where one (1) make is described and other makes are
5 listed, comparable models of other named equipment may also be used, provided they meet
6 requirements of Specifications.

7
8 When equipment or accessories used differ in arrangement, configuration, dimensions, ratings, or
9 engineering parameters from those on Drawing schedules, Contractor shall be responsible for costs
10 involved in integrating equipment or accessories into system. Contractor shall be responsible for
11 obtaining original design performance from system into which items are placed, regardless of
12 whether manufacturer/model is specified equivalent or substitute.

13
14 If Contractor wishes to use items other than those named in Specifications in base bid, request for
15 approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids.
16 Include complete technical and descriptive data with request. If approved, an Addendum will be
17 issued notifying bidders of approval. Request for approval will be considered only if requested by
18 prime bidding Contractor.

19
20 **EQUIPMENT INSTALLATION**

21 Drawings show general arrangement and location of equipment and appurtenances. It is
22 Contractor's responsibility to install equipment in a location and manner that allows for proper
23 service and maintenance access to equipment. Work shall generally conform to requirements
24 shown on Drawings. However, location of equipment may require field adjustments to obtain
25 required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment.
26 Because of scale of Drawings, it is not possible to indicate exact routing of piping, and offsets,
27 fittings and accessories required to provide proper service access to equipment. Contractor shall
28 route and install ductwork and piping to provide required service access to equipment.

29
30 If, during construction phase of Project, contractor feels inadequate space exists, or equipment
31 locations must be substantially modified to provide proper service and maintenance access, prior
32 to installing equipment, contractor shall notify engineer in writing, outlining general concerns and
33 proposed modifications. Equipment installed without providing manufacturer's required
34 maintenance and service clearance shall be considered defective. Contractor shall remove and
35 relocate piping, ductwork and equipment, to provide required service clearances at contractor's
36 expense.

37
38 **OPERATING AND MAINTENANCE INSTRUCTIONS**

39 Refer to Division 01 of the Project Manual.

40
41 Assemble material in three-ring or post binders, using an index at the front of each volume and
42 tabs for each system or type of equipment. In addition to the data indicated in the General
43 Requirements, include the following information:

- 44 • Copies of all approved shop drawings.
 - 45 • Manufacturer's wiring diagrams for electrically powered equipment
 - 46 • Records of tests performed to certify compliance with system requirements
 - 47 • Certificates of inspection by regulatory agencies
 - 48 • Parts lists for fixtures, equipment, valves and specialties.
 - 49 • Manufacturer's installation, operation and maintenance recommendations for fixtures,
50 equipment, valves and specialties.
 - 51 • Valve schedules
 - 52 • Lubrication instructions, including list/frequency of lubrication
 - 53 • Warranties
 - 54 • Additional information as indicated in the technical specification sections
- 55

1 **RECORD DRAWINGS**
2 Refer to Division 01 of the Project Manual.
3
4 Maintain Record Drawings on daily basis to be turned over at completion of Project.
5
6 **TRAINING OF OWNER PERSONNEL**
7 Instruct Owner's personnel in proper operation and maintenance of systems and equipment
8 provided as part of Project, using Operating and Maintenance manuals during instruction.
9 Demonstrate startup and shutdown procedures for equipment. Training shall be during normal
10 working hours.
11
12 **TESTING**
13 Provide materials, labor, and equipment required for testing.
14
15 Notify Inspector(s) one day prior to the time when the test is ready to be performed.
16
17 After testing, submit in writing the time, date, name and title of the person approving the test. This
18 shall also include the description and what portion of the system has been tested. The person
19 approving the test shall sign the submittal.
20
21 Records shall be maintained of testing that has been completed, and shall be made available at
22 the job site.
23
24 Upon completion of the work, records and certifications approving testing requirements shall be
25 submitted.
26
27 Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be
28 made with new materials.
29
30 **CLEANING**
31 Keep the premises broom clean and free of surplus materials, rubbish and debris.
32
33 After fixtures and equipment have been installed, remove stickers, rust stains, labels, and
34 temporary covers.
35
36 Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices,
37 switches, fixtures, and panels.
38
39 Identification plates on equipment shall be free of paint and dirt.
40
41 Leave the work in a condition ready for operation.
42
43 **WARRANTY**
44 Warrant that work shall function for one year immediately following acceptance of the system(s).
45
46 Keep the system in good working order at no expense, unless defects are clearly the result of
47 improper or abnormal usage.
48
49 Submit for acceptance of the work, written certification that the entire system has been installed
50 and adjusted for operation in accordance with the Contract Documents.
51
52
53
54
55

1 **PART 2 – PRODUCTS**

2
3 **ELECTRICAL REQUIREMENTS**

4 **General:**

5 Work shall conform to requirements of Division 26.

6
7 Power wiring shall be provided by the EC. Control wiring shall be provided by the PC. Plumbing
8 Contractor shall provide wiring diagrams for use by the Electrical Contractor.

9
10 **ACCESS PANELS AND DOORS**

11 Provide access panels at locations requiring access to mechanical equipment. Locations include,
12 but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces
13 concealing valves, ducts or equipment. Provide UL listed, fire rated access panels when
14 penetrating fire rated chase or shaft areas.

15
16 Access panels shall be of size required to provide adequate access to equipment. Minimum size
17 shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.

18
19 Panels shall be Milcor brand or equivalent.

20
21 Panels shall include concealed hinges, cam type locking devices, and have frame/border type
22 necessary for particular wall or ceiling construction they are installed. Access panels shall be flush
23 mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept
24 field painting for general applications and stainless steel for use in toilet rooms, shower rooms and
25 similar wet areas.

26
27 Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.

28
29 For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18
30 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location
31 applications and shall be key locked for public area applications.

32
33 **PIPE PENETRATIONS**

34 Refer to Division 01 requirements as well as the following.

35
36 **Fire, Smoke And Fire/Smoke Rated Surfaces:**

37 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite
38 sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall
39 penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop
40 System.

41
42 All fire stopping systems shall be provided by the same manufacturer.

43
44 UL listed or tested by independent testing laboratory, approved by State and Local Code
45 jurisdictions.

46
47 Use product that has a rating not less than rating of wall or floor being penetrated. Reference
48 architectural drawings for identification of fire and/or smoke rated walls and floors.

49
50 Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material
51 used includes a sleeve that is an integral part of rated assembly.

52
53 Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop
54 blocks, firestop mortar or a combination of these products to provide a UL listed system for each
55 application required for this project. Provide mineral wool backing where specified in manufacturer's
56 application detail.

1 **Non-Rated Surfaces:**
 2 Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering
 3 openings in occupied spaces.
 4
 5 In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking
 6 synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe
 7 and cored opening or a water-stop type wall sleeve.
 8
 9 At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex
 10 1a, Sonneborn Sonolastic NPI, or Mameco Vulkan 116 urethane caulk to effect seal. Use
 11 galvanized sheet metal sleeves in hollow wall penetrations.

12
 13 **EQUIPMENT, PIPING AND VALVE IDENTIFICATION**

14 **Equipment Labels:**
 15 After painting and covering, identify equipment, including pumps, tanks, compressors, and control
 16 panels. Locate identification conspicuously.

17
 18 Identification of equipment shall be by engraved white letters on a black 1/16 inch thick plastic
 19 laminate panel, beveled edges, screw mounting, permanently attached to the equipment.

20
 21 Minimum size:
 22 3/4" x 2 1/2" with 3/8" letters.

23
 24 Manufacturers:
 25 Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or
 26 equal by W. H. Brady.

27
 28 **Pipe Identification:**
 29 Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".

30
 31 Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in
 32 accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each
 33 branch, adjacent to each access door or panel, at each valve and where exposed piping passes
 34 through walls and floors.

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1 1/4"	1/2"
1 1/2" to 2"	3/4"
2 1/2" to 6"	1 1/2"

35
 36
 37 Manufacturers:
 38 EMED Co., Seton Name Plate Company, or W. H. Brady.

39
 40 Stencils:
 41 Not less than 1 inch high letters/numbers for marking pipe and equipment.

42
 43 **Valve Tags:**
 44 Identify each valve by means of 1 1/2" diameter brass tag fastened to body of valve with copper or
 45 brass chain. Identification number shall be stamped thereon with letters a minimum of 1/2" high.
 46 System identification abbreviation shall be stamped with letters a minimum of 1/4" high.

47
 48 The following prefixes shall be used:
 49 PLBG - Plumbing

50

1 Manufacturers:
2 EMED Co., Seton Name Plate Company, or W. H. Brady.

3
4 **Valve Charts:**

5 Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart
6 shall be framed behind glass and hung in location selected by Owner. Charts shall show the
7 following:

8
9

Valve number	Size
Manufacturer	Type of valve
Type of service	Location

10
11
12

13 Furnish a typewritten chart indicating equipment or areas served by each numbered valve and
14 incorporate in Operating and Maintenance Manuals.

15
16 **EQUIPMENT ACCESSORIES**

17 Provide equipment accessories, connections, and incidental items.
18 Install piping connecting to pumps and other equipment without strain at the piping connection. If
19 requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to
20 demonstrate that piping has been properly connected.

21
22 **BEDDING AND BACKFILL**

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

25

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

26

27 Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of
28 large stones, organic, perishable, and frozen materials.

29
30 Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and
31 buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones,
32 organic, perishable, and frozen materials.

33
34
35 **PART 3 – EXECUTION**

36
37 **GENERAL**

38 **Coordination of Work:**

39 Review the complete set of Drawings and Specifications and report discrepancies to the A/E.
40 Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning
41 installation and make provisions to avoid interferences. Changes required caused by neglect to
42 coordinate shall be made without expense to the project.

43
44 Piping shall not be located above electrical panels.

45
46 **Anchor Bolts, Sleeves, and Supports:**

47 These items required for the Work shall be furnished by the FPC for proper installation of his work.
48 They shall be installed (except as otherwise specified) by the trade furnishing and installing the
49 material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports

1 shall be directed by the trade requiring them. Expense resulting from the improper location or
2 installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor for the
3 trade with responsibility for directing their proper location.

4
5 **Adjustments In Locations:**

6 Locations of pipes and equipment, shall be adjusted to accommodate the work interferences
7 anticipated and encountered. Prior to fabrication determine the exact route and location of each
8 pipe (subject to A/E's approval).

9
10 **Right Of Way:**

11 New lines which pitch shall have the right-of-way over those which do not pitch. For example:
12 Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall
13 have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of
14 conflicts.

15
16 Offsets, transitions and changes in direction of electrical raceways, pipes, and ducts shall be made
17 to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings.

18
19 **ASBESTOS ABATEMENT**

20 Asbestos abatement shall be by the Owner. If asbestos is encountered, the Owner shall be notified.
21 Asbestos materials shall be removed prior to continuing work.

22
23 **DEMOLITION**

24 Perform all demolition as indicated on the drawings to accomplish new work. Where demolition
25 work is to be performed adjacent to existing work that remains in an occupied area, construct
26 temporary dust partition to minimize the amount of contamination of the occupied space. Where
27 pipe is removed and not reconnected with new work, cap ends of existing services as if they were
28 new work. Coordinate work with the Owner to minimize disruption to the existing building
29 occupants.

30
31 All pipe, fixtures, equipment, wiring, associated conduit and similar items demolished, abandoned,
32 or deactivated are to be removed from the site by the Contractor except as specifically noted
33 otherwise. All designated equipment is to be turned over to the Owner for his use at a place and
34 time he so designates. Maintain the condition of material and/or equipment that is indicated to be
35 reused equal to that existing before work began.

36
37 **EXCAVATION AND BACKFILL**

38 Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure
39 no disturbance of bearing soil.

40
41 Before burying piping, mark up Record Drawings and dimensionally locate piping. Deliver
42 information to A/E Field Representative.

43
44 Unless otherwise specifically indicated on Drawings, trenches for utilities shall be of depth that
45 provides the following minimum depths of cover from existing grade or from indicated finish grade,
46 whichever is lower:

47
48 Storm and sanitary sewers:

49 As described in DPS 382.30 (11) (b). Provide insulation for sewers installed at less than
50 minimum depth.

51
52 Water service and/or fire service piping:

53 The top of pipe shall be installed not less than six (6) feet below grade.

54
55 Existing utility lines to be retained shown on Drawings or locations of which are made known to
56 Contractor prior to excavation, as well as utility lines uncovered during excavation operations, shall

1 be protected from damage during excavation and backfilling and if damaged, shall be repaired by
2 Contractor at his expense.

3
4 **General:**

5 Each Contractor shall perform excavation required for his work and of whatever substances
6 encountered, to depths indicated on Drawings or as otherwise specified. Excavation shall comply
7 with OSHA regulations. Review soil boring information for soil information. During excavation,
8 material for backfilling shall be piled in an orderly manner a safe distance from banks of trench to
9 avoid overloading and to prevent slides or cave-ins. Excavated materials not required or acceptable
10 for backfill shall be removed and wasted as requested by A/E.

11
12 Grading shall be done as necessary to prevent surface water from flowing into trenches or
13 excavations. Water accumulating shall be removed by pumping or by other acceptable methods.

14
15 Sheeting or shoring shall be done as necessary for protection of Work and for safety of personnel.
16 Comply with OSHA regulations. In particular, comply with Department of Labor (OSHA) 29 CFR,
17 Part 1926 Occupational Safety and Health Standards. Specific mention of this Section however
18 shall in no way imply, suggest or infer that compliance with other sections or regulations is not
19 required.

20
21 Excavation shall be by open cut except short sections of a trench may be tunneled if, in the opinion
22 of Soils Engineer, pipe or duct can be safely and properly installed and backfill can be properly
23 tamped in tunnel sections per OSHA regulations. Each excavation shall comprise required
24 materials and shall include clay, silt, sand, rock, muck, gravel, hardpan, loose shale and loose
25 stone.

26
27 Open trench ahead of pipe laying to reveal obstructions.

28
29 Provide trench crossings to accommodate public travel.

30
31 Contractor shall file written "Notification of Excavation" with utility companies and Digger's Hotline
32 at least three (3) days prior to excavating.

33
34 **Trench Excavating:**

35 Trenches shall be of necessary width or proper laying of pipe but not more than 16 inches wider
36 than pipe diameter at base, and banks shall be provided per OSHA regulations. In particular,
37 comply with the Department of Labor (OSHA) 29 CFR, Part 1926 Occupational Safety and Health
38 Standards. Specific mention of this Section however, shall in no way imply, suggest or infer that
39 compliance with other sections or regulations is not required. Bottom of the trenches shall be
40 accurately graded to provide uniform bearing and support for each section of pipe on undisturbed
41 soil at points along its entire length. Except where rock is encountered, care shall be taken not to
42 excavate below the depths indicated.

43
44 Where rock excavations are required, rock shall be excavated to a minimum overdepth of 4inches
45 below trench depths indicated on Drawings or specified. Overdepths in rock excavations and
46 unauthorized overdepths shall be backfilled with loose granular material properly compacted.

47
48 Whenever wet or otherwise unstable soil incapable of properly supporting pipe, as determined by
49 Soils Engineer, is encountered in bottom of trench, soil shall be removed to depth required and
50 trench backfilled to proper grade with coarse sand, fine gravel or other material as specified.

51
52 Keep trenches free from water while construction is in progress. Pipe or appurtenances shall not
53 be laid in water. Pump or bail water from bell holes to permit proper jointing of pipes. Pipe discharge
54 from trench dewatering to drains or natural drainage channels.

1 **Grading Trench Bottom:**
2 Shape bottom of trench for Class C bedding except as otherwise noted. Perform grading of trench
3 bottoms by hand tools. Grade bottom of trenches evenly to insure bearing for pipes. Cut holes for
4 joints and joint making.
5
6 **Pipe Bedding:**
7 Crushed stone chips or bedding sand carefully compacted according to Class "B" bedding
8 standards.
9
10 **Excavations for Appurtenances:**
11 Excavations for manholes and similar structures shall leave at least 12 inches clear between their
12 outer surfaces and embankment or sheeting and shoring that may be used to hold and protect
13 banks. Any over-depth excavation below appurtenances not requested by A/E shall be considered
14 as unauthorized and shall be backfilled with sand, gravel or concrete at expense of Contractor.
15
16 **Backfilling of Trenches:**
17 Backfill trenches only after piping has been inspected, tested and locations of pipe lines and
18 appurtenances have been recorded. Comply with OSHA regulations for work. In particular, comply
19 with Department of Labor (OSHA) 29 CFR, Part 1926 Occupational Safety and Health Standards.
20 Specific mention of this Section however, shall in no way imply, suggest or infer compliance with
21 other Sections or regulations is not required.
22
23 For depth of 12 inches above top of pipe, backfill by hand with material specified for compacted
24 backfill. Tamp backfill thoroughly in layers not exceeding 6 inches in thickness, taking care not to
25 disturb the pipe.
26
27 For the remaining trench backfill and compact with material as specified in the following
28 paragraphs.
29
30 Jetting the backfill with water will not be permitted unless approved in writing by the A/E.
31
32 **Normal Backfill:**
33 Where compacted backfill is not specified, trenches shall be carefully backfilled with excavated
34 materials acceptable for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft
35 shale or other acceptable materials, free from large clods of earth or stones over 2-1/2 inch
36 maximum dimension, deposited in 12-inch layers and compacted.
37
38 Surface shall be graded to reasonable uniformity and mounding over trenches left in uniform and
39 neat condition.
40
41 **Compacted Backfill:**
42 Compacted backfill shall be used under slab on grade, slabs within building structure, concrete
43 paving and asphaltic concrete paving. Soils used in fill shall be granular in nature and not contain
44 roots, sod, rubbish or stones over 2-1/2 inch maximum dimension. A/E may reject on-site or
45 borrowed materials he considers unsuitable for intended use of fill.
46
47 **Compaction Density for Backfill:**
48 Fills shall be compacted to dry density equal to at least 95percent of maximum density determined
49 in accordance with Procter Test, ASTM D698-66T or modified D1557-66T. Maximum density and
50 optimum moisture content shall be determined by A/E on basis of laboratory test conducted on
51 materials used in fill.
52
53 **Control Test:**
54 Field density tests for determining compaction of fill in place shall be performed by a qualified
55 Geotechnical Engineer in accordance with standard recognized procedures for making required
56 tests. Contractor shall arrange and pay for tests and extend full cooperation to Geotechnical

1 Engineer in obtaining soil samples for field and lab testing. A minimum of 1 test per 50 lineal feet
2 for each 2 foot lift. Contractor shall pay for density tests and submit reports.
3

4 Adequacy of compaction shall be determined on basis of in-place density determinations to be
5 conducted while fills are being placed. Results of tests shall be basis on which satisfactory
6 completion of work is judged. If fills fail to meet specified densities, Contractor shall remove and
7 recompact soils until specified densities are achieved.
8

9 **Equipment:**

10 The choice of compaction shall be made by the Contractor; however, the equipment shall be
11 adequate for achieving the specified densities. To achieve adequate compaction at locations
12 inaccessible to roller type equipment, use of hand operated, power driven compaction equipment
13 may be necessary.
14

15 **ROCK EXCAVATION**

16 Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the
17 pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified
18 masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics
19 of solid rock; which material is so hard or so firmly cemented that in the opinion of the Engineer it
20 is not practical to excavate and remove same with a power shovel except after thorough and
21 continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more
22 in volume.
23

24 Rock excavation will be computed on the basis of the depth of rock removed and a trench width
25 two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and
26 three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench.
27 Include 6 inch pipe and structure bedding in rock excavation. Include rock excavation shown on
28 the plans in the Base Bid.
29

30 **SURFACE RESTORATION**

31 Completely restore the surface of all disturbed areas to a like condition of the surface prior to the
32 work. Level off all waste disposal areas and clean up all areas used for the storage of materials or
33 the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.
34

35 **CONCRETE WORK**

36 Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into
37 concrete or used to form concrete for support or installation of plumbing piping, fixtures, specialties
38 and equipment. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with the
39 Division 03 Contractor.
40

41 **OPENINGS, CUTTING AND PATCHING**

42 Refer to Division 01 of the Project Manual.
43

44 Provisions for openings including chases, holes and clearances through walls, floors, and roof,
45 ceilings and partitions shall be made in advance of construction of each part of the building.
46 Openings shall be provided by the GC for the respective materials in which openings occur, during
47 the construction of the building with the exception of pipe sleeves. The PC shall furnish to the GC
48 opening dimensions and locations.
49

50 If the PC neglects to inform the GC of his opening requirements before that portion of the building
51 construction is complete, the PC shall cut the openings and provide framing and lintels. In the
52 event holes must be cut through reinforced concrete, avoid spalling and unnecessary damage or
53 weakening of structural members. No chopping or breaking out is permitted. Before cutting or
54 drilling, obtain permission from the A/E. Patch adjacent materials and repair damage resulting from
55 the cutting.

1 The PC may perform core drilling for openings in existing walls and floors at the direction of the
2 A/E. Framed openings shall be by the GC.

3
4 Patch interior trench excavation to match existing slab-on-grade with concrete: 3500 PSI at 28
5 days, 3" slump, 3/4" maximum aggregate size, 5.5 bags of cement per cubic yard.

6 7 **BUILDING ACCESS**

8 Arrange for necessary openings in building to allow for admittance of all apparatus. When building
9 access was not previously arranged and must be provided by Contractor, restore opening to
10 original condition after the apparatus has been brought into building. Coordinate with
11 Architect/Engineer.

12 13 **EQUIPMENT ACCESS**

14 Install piping, conduit, fixtures, and accessories to permit access to equipment for maintenance.
15 Coordinate exact location of wall and ceiling access panels and doors with General Contractor,
16 making sure access is available for equipment and specialties. Where access is required in plaster
17 walls or ceilings, furnish and install access doors required. Coordinate for installation of access
18 doors utilizing General Contractor and other appropriate on-site subcontractor for access door
19 installation.

20
21 Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb
22 tacks or screws, depending on surface, for use in accessible ceilings.

23 24 **COORDINATION OF WORK**

25 Install systems, equipment and piping in cooperation with other trades. Locations of pipes,
26 equipment, fixtures, etc., shall be adjusted to accommodate the work interferences anticipated and
27 encountered. Prior to fabrication determine the exact route and location of each pipe (subject to
28 A/E's approval).

29
30 Any work that is not coordinated and that interferes with other contractor's work shall be removed
31 or relocated at the installing contractor's expense.

32
33 Verify that all devices are compatible for the type of construction and surfaces on which they will
34 be used.

35
36 Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made
37 as required to maintain proper room and pitch of sloping lines whether or not indicated on the
38 Drawings. Furnish and install all traps, air vents, sanitary vents, etc., as required to effect the
39 offsets, transitions and changes in direction.

40
41 New lines which pitch shall have the right-of-way over those which do not pitch. For example:
42 Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall
43 have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of
44 any conflicts.

45
46 Provide appropriate sections of work with required wall, roof and floor opening locations and
47 dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of
48 Contractor.

49 50 **PIPING INSTALLATION**

51 **General:**

52 Expansion and contraction of piping shall be provided for by expansion loops, bends, swing joints,
53 or expansion joints to prevent damage to connections, piping, equipment of the building.

54
55 Unions or flanges shall be installed on all by-passes, ahead of all traps, adjacent to screw
56 connection valves, and at all connections to equipment, whether or not shown on drawings.

1 **Installation Arrangement:**

2 Install all Work to permit removal (without damage to other parts) of all parts requiring periodic
3 replacement or maintenance. Arrange pipes and equipment to permit ready access to valves,
4 cocks, traps, starters, motors, control components and to clear the openings of swinging and
5 overhead doors and of access panels.
6

7 **Connections Different From Those Shown:**

8 Where equipment requiring different arrangement or connections from those shown is used, install
9 the equipment to operate properly and in harmony with the intent of the Drawings and
10 Specifications. When requested by the A/E, submit drawings showing the proposed installation.
11

12 If the proposed installation is approved, make all incidental changes in piping, ductwork, supports,
13 insulation, wiring, panelboards, etc. Provide any additional motors, controllers, valves, fittings and
14 other additional equipment required for the proper operation of the system resulting from the
15 selection of equipment, including all required changes in affected trades. The Contractor shall be
16 responsible for the proper location of rough-in and connections by other trades.
17

18 All changes shall be made at no increase in the Contract amount or additional cost to the other
19 trades.
20

21 **SLEEVES**

22 Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to
23 provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall
24 construction and finish. Grout area around sleeve in masonry construction. In finished spaces
25 where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush
26 with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is
27 not required.
28

29 Pipe sleeves are not required in existing poured concrete walls where penetrations are core drilled.
30

31 Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow
32 insulated pipe to run through sleeve), cast in place.
33

34 In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 1 inch above
35 the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to
36 insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If
37 the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or
38 struts to the sleeve that will transfer weight to existing floor structure.
39

40 For floor penetrations through existing floors in mechanical, core drill opening and provide 1-1/2" x
41 1-1/2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of
42 penetrations to prevent water from entering the penetration. Provide urethane caulk between
43 angles and floor and fasten angles to floor a minimum of 8" on center. Seal corners water tight with
44 urethane caulk. Or, core drill sleeve openings large enough to insert schedule 40 sleeve and grout
45 area around sleeve with hydraulic setting non-shrink grout/cement.
46

47 For pipe penetrations through existing floors in food service areas, core drill sleeve opening large
48 enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink
49 grout/cement. Size sleeve to allow insulated pipe to pass through sleeve and paint the sleeve.
50

51 Pipe sleeves are not required in cored floor pipe penetrations through existing floors that are not
52 located in mechanical rooms, food service areas or wet locations listed above.
53

1 **PIPE PENETRATIONS**

2 **General:**

3 Coordinate location of building surface penetrations with appropriate contractors. Furnish sleeves,
4 inserts, and devices to be built into structure to contractor performing Work. Prepare Shop
5 Drawings for approval for penetrations of structural elements, including floor slabs, shear walls,
6 and bearing walls. Do not allow penetrations to be made until Shop Drawings are approved.

7
8 **Fire Rated Surfaces:**

9 Install products in accordance with the manufacturer's instructions where pipe penetrates a fire
10 rated surface. When pipe is insulated, use product that maintains integrity of insulation and vapor
11 barrier. Where sleeve must be installed in existing floor, grout area around sleeve to restore floor
12 integrity. In wet area floor penetration, top surface of penetration to be 2 inches above adjacent
13 floor with additional height obtained by means of concrete pad poured integral with floor.

14
15 **Non-Rated Surfaces:**

16 Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied
17 spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required
18 when insulation completely covers wall opening and insulation end is trimmed in a neat manner.
19 Occupied spaces for this Paragraph include only those rooms with finished ceilings and penetration
20 occurs below ceiling.

21
22 In exterior wall openings below grade, place water-stop type wall sleeve before concrete pour or
23 core drill opening after pour. Assemble rubber links to proper size for pipe and tighten in place in
24 accordance with manufacturer's instructions.

25
26 Install galvanized sheet metal sleeve in hollow wall penetrations to provide backing for sealant.
27 Apply sealant to both sides of penetration in a manner that annular space between pipe sleeve and
28 pipe or insulation is completely blocked.

29
30 Completely seal (or caulk) around pipe penetrations through non-rated, smoke tight corridor walls
31 in healthcare facilities. Refer to architectural drawings for additional information.

32
33 **ESCUTCHEON PLATES**

34 Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter
35 to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface.
36 Escutcheon plates shall be chromium plated metal.

37
38 **PAINTING**

39 Refer to Division 09.

40
41 All exposed steel support structures (all metal surfaces located both inside and outside the building)
42 shall be painted after installation with one coat of a compatible metal primer coat and two coats of
43 a finish coat of paint for the application. Color shall be gray unless otherwise specified.

44
45 **IDENTIFICATION**

46 Identify equipment in mechanical equipment rooms by stenciling equipment number and service
47 with one coat of black enamel against a light background or white enamel against a dark
48 background. Use a primer where necessary for proper paint adhesion.

49
50 Where stenciling is not appropriate for equipment identification, engraved name plates may be
51 used.

52
53 Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent
54 to each access door or panel, and on both side of the partition where accessible piping passes
55 through walls or floors. Place flow directional arrows at each pipe identification location. Use one
56 coat of black enamel against a light background or white enamel against a dark background.

1 Identify all exterior buried piping for entire length with underground warning tape except for sewer
2 piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below
3 finished grade along entire length of pipe. Extend tape to surface at building entrances, meters,
4 hydrants and valves. Where existing underground warning tape is broken during excavation,
5 replace with new tape identifying appropriate service and securely spliced to ends of existing tape.
6
7 Identify valves with brass tags bearing a system identification and a valve sequence number.
8 Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded
9 engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve
10 tags are not required at a terminal device unless the valves are greater than ten feet from the
11 device, located in another room or not visible from device. Provide a typewritten valve schedule
12 and pipe identification schedule indicating the valve number and the equipment or areas supplied
13 by each valve and the symbols used for pipe identification; locate schedules in mechanical room
14 and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under
15 clear plastic.

16
17
18

END OF SECTION

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**SECTION 22 05 14
PLUMBING SPECIALTIES**

PART 1 - GENERAL

SCOPE

This section includes specifications for backflow preventers, hose bibs, water hammer arrestors and other miscellaneous plumbing specialties. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Submittals

PART 2 - PRODUCTS

- General
- Pressure Regulating Valves (PRV)

PART 2 - EXECUTION

- Installation

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

- Section 22 05 00 – Common Work Results for Plumbing
- Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment
- Section 22 07 00 – Plumbing Insulation
- Section 22 11 00 – Facility Water Distribution
- Section 22 13 00 – Facility Sanitary Sewerage
- Section 22 40 00 – Plumbing Fixtures

REFERENCE STANDARDS

- ANSI A112.14.1 - Backwater Valves
- ANSI A112.26.1/PDI WH-201 - Water Hammer Arrestors.
- ASSE 1001 - Pipe Applied Atmospheric Type Vacuum Breakers.
- ASSE 1010 - Water Hammer Arrestors.
- ASSE 1011 - Hose Connection Vacuum Breakers.
- ASSE 1012 - Backflow Preventers with Intermediate Atmospheric Vent.
- ASSE 1013 - Reduced Pressure Principle Backflow Preventers.
- ASSE 1018 - Trap Seal Primer Valves.
- ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SUBMITTALS

Submit product data sheets in accordance with Division 01 and Section 22 05 00.

1 Submit and pay all fees to State of Wisconsin for reduced pressure zone backflow prevention
2 device review. Submit State approval of reduced pressure zone backflow prevention device with
3 product data sheets in accordance with Division 01 and Section 22 05 00.
4

5 6 **PART 2 - PRODUCTS**

7 8 **GENERAL**

9 Refer to Plumbing Equipment Schedule for specific model numbers and sizing information
10 regarding the plumbing fittings and specialties specified herein.
11

12 13 **PRESSURE REGULATING VALVES (PRV)**

14 Pressure regulating valves shall be manufactured by Cash Acme, Wilkins, or Watts.
15

16 Directing acting, spring regulating, bronze body, high temperature resistant diaphragm, ASSE
17 1003. Include strainer with stainless steel mesh screen and pressure gauges on inlet and outlet of
18 PRV.
19

20 Size strainer for flow rate in main with 10 lb/in² drop off, not line size.
21
22

23 **PART 3 - EXECUTION**

24 25 **INSTALLATION**

26 **Backwater Valves:**

27 Install per Plumbing Code.
28

29 **Pressure Regulating Valves:**

30 Adjust PRV to regulate outlet water pressure to pressure indicated on plans.
31
32

33 **END OF SECTION**

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

PART 1 - GENERAL

SCOPE

This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Design Criteria
- Submittals

PART 2 - PRODUCTS

- Manufacturers
- Pipe Hangers and Supports
- Pipe Hanger Rods
- Riser Clamps
- Concrete Inserts
- Anchors
- Equipment Support
- Corrosive Atmosphere Coatings

PART 3 - EXECUTION

- Installation
- Structural Supports
- Hanger and Support Spacing
- Riser Clamps
- Concrete Inserts
- Anchors

RELATED WORK

Applicable provisions of Division 01 shall govern work under this section.

- Section 22 05 00 – Common Work Results for Plumbing
- Section 22 07 00 – Plumbing Insulation
- Section 22 11 00 – Facility Water Distribution
- Section 22 13 00 – Facility Sanitary Sewerage
- Section 22 40 00 – Plumbing Fixtures

REFERENCE STANDARDS

- MSS SP-58
- MSS SP-69

QUALITY ASSURANCE

Refer to Division 01, of the Project Manual.

1 **DESIGN CRITERIA**

2 Materials and application of pipe hangers and supports shall be in accordance with MSS Standard
3 Practice SP-58 and SP-69 unless noted otherwise.

4
5 Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have
6 vibration isolation supports for a distance of one hundred pipe diameters or three supports away
7 from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this
8 section are required beyond the 100 pipe diameter/3 support distance.

9
10 Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom
11 chord of any truss or joist.

12
13 **General:**

14 Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and
15 contraction.

16
17 Design supports of strength and rigidity to suit loading, service, and manner which do not unduly
18 stress the building construction. Where support is from concrete construction, take care not to
19 weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing
20 wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire
21 as hangers.

22
23 Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where
24 inserts are not practical, provide channels or angles from which to suspend hangers/supports.
25 Fasten structural steel to concrete with expansion bolts.

26
27 Provide expansion anchors in concrete slabs for installation of threaded support rods.

28
29 Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with
30 hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide
31 double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers
32 to structural steel.

33
34 On piping insulated with vapor barrier covering, use protection shield to cover bottom one-half of
35 insulated pipe. Shield to be a minimum of 12" long and of 16 gauge galvanized steel.

36
37 Exception:

38 For insulated drain pipe, the pipe may rest on the hanger and the insulation to wrap around
39 the hanger and pipe.

40
41 Submit anchor drawings for approval upon request.

42
43 Hangers, supports, and support methods other than those specified shall not be used without
44 obtaining approval on method of support by the Structural Engineer prior to installing piping
45 systems. Submit support method arrangement, pipe weight and spacing scheme for approval.

46
47 **Support Spacing:**

48 Support horizontal piping per following table:

Pipe Size	Rod Diameter	Max Span (Feet)	
		Copper	Steel
Up to 1¼"	3/8"	6	8
1½" and 2"	3/8"	10	10
2½" and 3"	1/2"	10	12

- 1 Support horizontal lines of hub and spigot cast iron pipe with hanger, spaced not more than 5 feet
 2 on center; locate support close to hub. Rod diameter shall be as for steel pipe.
 3
- 4 Support cast iron No-Hub pipe as recommended in CISPI Publication "Suggestions for Cast Iron
 5 No-Hub Pipe and Fittings". Rod diameter shall be as for steel pipe.
 6
- 7 Support horizontal lines of PVC pipe with hangers, spaced not more than 3 feet on center at branch
 8 ends and changes of direction. Rod diameter shall be as for steel pipe.
 9
- 10 Provide vertical support at each floor level as the pipe passes through the floor. For piping that
 11 does not pass through the floor, provide adequate support to stabilize the vertical portion of the
 12 piping.
 13
- 14 Provide galvanized steel supports for cast iron and steel piping.
 15
- 16 Provide PVC dipped hangers or provide Unistrut "Uni-Cushion" vinyl strip at galvanized hangers
 17 for copper lines.
 18
- 19 **Hanger and Support Spacing:**
 20 Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 21
- 22 Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty
 23 item.
 24
- 25 Use hangers with 1-1/2 inch minimum vertical adjustment.
 26
- 27 Where several pipes can be installed in parallel and at the same elevation, provide multiple or
 28 trapeze hangers.
 29
- 30 Support riser piping independently of connected horizontal piping.
 31
- 32 Adjust hangers to obtain the slope specified in the piping section of these specifications.
 33
- 34 Space hangers for pipe as follows:
 35

Pipe Material	Pipe Size	Max. Spacing	Horiz.	Max. Vert. Spacing
Cast Iron	2" and larger	5'-0"		15'-0"
Copper	1/2" through 3/4"	5'-0"		10'-0"
Copper	1" through 1-1/4"	6'-0"		10'-0"
Copper	1-1/2" through 2-1/2"	8'-0"		10'-0"
Ductile Iron	All	10'-0"		20'-0"
Steel	1/2" through 1-1/4"	7'-0"		15'-0"
Steel	1-1/2" through 6"	10'-0"		15'-0"
Plastic	Drain and Vent	4'-0"		10'-0"
Plastic	1" or less	32"		4'-0"
Plastic	1-1/4" and over	4'-0"		6'-0"

- 36
- 37 **SUBMITTALS**
 38 Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.
 39
- 40 Schedule of all hanger and support devices indicating attachment methods and type of device for
 41 each pipe size and type of service.
 42

1 Submit anchor drawings to the A/E for approval upon request.
2
3

4 **PART 2 - PRODUCTS**

5 6 **MANUFACTURERS**

7 B-Line, Fee and Mason, Grinnell, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology,
8 Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.
9

10 **PIPE HANGERS AND SUPPORTS**

11 **Overhead Supports:**

12 Adjustable clevis hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3100.
13

14 Adjustable J hook hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line figure B3690.
15

16 Adjustable band hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3172.
17

18 **Multiple or Trapeze Hangers:**

19 Where several pipes are running parallel and pitching in the same direction, strut style support may
20 be used. Steel channel, 12-gauge thickness, Dura-Green epoxy coating or electro-plated, B-Line
21 B11. Restrain individual pipes with B-Line B2000 series or Vibraclamp series strut clamps.
22

23 **Wall Support:**

24 Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194 Series.
25

26 Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall
27 structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S
28 channel with B-2000 series clamps, Grinnell type PS 200 H with PS 1200 clamps.
29

30 When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion
31 material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-
32 Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT
33 series, Grinnell PS 1400 series.
34

35 **Vertical Support:**

36 Riser clamp, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3373.
37

38 Riser clamp, flexible sleeve with stainless steel band, Proset PS #33.
39

40 **Floor Support:**

41 Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.
42

43 **Copper Pipe Supports:**

44 All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or
45 polyvinylchloride coated. Where steel channels are used, provide isolation collar between
46 supports/clamps/fasteners and copper piping.
47

48 **PIPE HANGER RODS**

49 **Steel Hanger Rods:**

50 Steel, electro-plated, threaded both ends, threaded one end, or continuous threaded, complete with
51 adjusting and lock nuts. B-Line B3205.
52

53 Size rods for individual hangers and trapeze support as indicated in the following schedule:
54

1 Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to
2 exceed the limits indicated.
3

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

4

5 **BEAM CLAMPS**

6 MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches
7 thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a
8 hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

9

10 MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place,
11 suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

12

13 **CONCRETE INSERTS**

14 **Poured in Place:**

15 MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable
16 malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert
17 to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505,
18 Grinnell 281.

19

20 MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a
21 removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N,
22 Grinnell 282.

23

24 **Drilled Fasteners:**

25 Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating, minimum
26 tension load of 3200 pounds. Use drill bit of same manufacturer as anchor.

27

28 Manufactured By:

29 Hilti, Powers/Rawl, Redhead.

30

31 **ANCHORS**

32 Use welding steel shapes, plates, and bars to secure piping to the structure.

33

34 **EQUIPMENT SUPPORT**

35 Examine Drawings, and manufacturer's data to determine how equipment, fixtures, and piping are
36 to be supported, mounted or suspended. Support all equipment plumb, rigid, and true to line.
37 Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

38

39 **Equipment Stands:**

40 Use structural steel members welded to and supported by pipe supports. Clean, prime and coat
41 with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather,
42 treat with corrosive atmosphere coatings.

43

44

45

1 **CORROSIVE ATMOSPHERE COATINGS**

2 Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after
3 fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize
4 threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be
5 field covered with zinc rich paint of comparable thickness to factory coating.

6
7 Corrosive atmospheres include the following locations:

- 8 • Locker rooms

9
10 **PART 3 - EXECUTION**

11
12 **INSTALLATION**

13 Size, apply and install supports and anchors in compliance with manufacturers recommendations.

14
15 Install supports to provide for free expansion of the piping system. Support all piping from the
16 structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten
17 ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of
18 the fastening.

19
20 Coordinate hanger and support installation to properly group piping of all trades.

21
22 Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard
23 structural shapes or continuous insert channels for the supporting steel. Where continuous insert
24 channels are used, pipe supporting devices made specifically for use with the channels may be
25 substituted for the specified supporting devices provided that similar types are used and all data is
26 submitted for prior approval.

27
28 Size and install hangers and supports, except for riser clamps, for installation on the exterior of
29 piping insulation. Where a vapor barrier is not required, hangers may be installed either on the
30 exterior of pipe insulation or directly on piping.

31
32 Perform welding in accordance with standards of the American Welding Society.

33
34 **STRUCTURAL SUPPORTS**

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

38
39 **RISER CLAMPS**

40 Support vertical piping with clamps secured to the piping and resting on the building structure or
41 secured to the building structure below at each floor.

42
43 **CONCRETE INSERTS**

44 Select size based on the manufacturer's stated load capacity and weight of material that will be
45 supported. Use inserts for suspending hangers from reinforced concrete slabs and sides of
46 reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts
47 carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are
48 flush with the slab surface.

49
50 **ANCHORS**

51 Install where indicated on the drawings and details. Where not specifically indicated, install anchors
52 at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops.
53 Make provisions for preset of anchors as required to accommodate both expansion and contraction
54 of piping.

55 **END OF SECTION**

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**SECTION 22 07 00
PLUMBING INSULATION**

PART 1 - GENERAL

SCOPE

This Section includes insulation specifications for plumbing systems. Included are the following requirements:

PART 1 – GENERAL

- Scope
- Related Work
- Description
- Quality Assurance
- Definitions
- Submittals

PART 2 – PRODUCTS

- Acceptable Manufacturers
- Insulation and Jackets

PART 3 - EXECUTION

- General
- Installation
- Pipe Insulation Schedule

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

- Section 22 05 00 - Common Work Results for Plumbing
- Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
- Section 22 11 00 - Facility Water Distribution
- Section 22 13 00 - Facility Sanitary Sewerage

DESCRIPTION

Furnish and install insulating materials, fittings, finishes, and accessories specified for piping and related equipment. The following types of insulation are specified in this Section:

- Pipe insulation

Install insulation materials in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these Specifications, or where prior written approval has been obtained from Engineer.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Label insulating products delivered to construction site with the manufacturer's name and description of materials.

DEFINITIONS

Concealed:

Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. Other areas, including walk-through tunnels, shall be considered as exposed.

1 **Exposed to weather:**

2 Located outdoors, either on grade, on a wall, or on a roof, in location where sun, wind, rain, snow
3 and other elements will come in contact with it.

4
5 **Unconditioned spaces:**

6 Unheated or non-cooled attics, utility tunnels and crawl spaces where ambient temperatures may
7 rise above 90 degrees F, or drop below 50 Degrees F. Ducts in these instances are considered to
8 be located outside of building thermal envelope.

9
10 **SUBMITTALS**

11 Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual

12
13 Include manufacturer's data for the following:

- 14 • Pipe insulation

15
16 Submittal shall include the following information:

17
18 Manufacturer's technical data sheets for each product with the following information:

- 19 • Density
- 20 • Thermal characteristics
- 21 • Temperature limitations
- 22 • Jacket type
- 23 • Materials of composition
- 24 • Material safety data sheets

25
26 Schedule of all insulating materials to be used including:

- 27 • Application / intended use of each insulation type
- 28 • Insulation type and thickness
- 29 • Jacket type
- 30 • Fastening methods and adhesive type

31
32
33 **PART 2 - PRODUCTS**

34
35 **ACCEPTABLE MANUFACTURERS**

36 Armstrong, Halstead, Johns-Manville, Knauf, or Owens-Corning.

37
38 **INSULATION AND JACKETS**

39 **Glass Fiber:**

40 Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible, "K" Value: 0.23 at 75°F,
41 maximum service temperature: 850°F, with vapor Retarder Jacket: AP-T Plus White Kraft paper
42 reinforced with glass fiber yarn and bonded to aluminum foil, secure with self-sealing longitudinal
43 laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as
44 needed.

45
46 **PVC Fitting Covers and Jackets:**

47 White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II,
48 Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity,
49 ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to
50 be .02 inch (20 mil).

1
2
3 **PART 3 - EXECUTION**

4 **GENERAL**

5 Application of insulation to piping equipment shall be done in accordance with the manufacturer's
6 installation recommendations. Where thickness of insulation is not specified, use thickness
7 recommended by manufacturer or required by applicable Codes.

8 Insulation shall be applied in as warm an environment as possible, and in no instance below 25° F.

9
10 No pipe shall be covered until after it has been installed, inspected, tested and approved.

11
12 **INSTALLATION**

13 All pipe insulation shall be installed with joints butted firmly together. All valves and fittings shall
14 be insulated with mitered sections of insulation equal in density and thickness to the adjoining
15 insulation, or with insulating cement equal in thickness to the adjoining insulation, or with "Zeston"
16 type, premolded PVC fittings installed in accordance with the manufacturer's instructions. Fittings
17 are to be finished with 8 oz. glass mesh and mastic (use breather mastic on systems operating
18 above 50°F except where Zeston PVC covers are used). Jackets on pipe insulation may be stapled
19 using outward clinch staples spaced 3" apart at least ¼" in from the lap edge on systems operating
20 at 60°F and above; below 50°F the laps are to be vapor sealed using self-sealing lap, lap-seal tape
21 gun or adhesive such as Armstrong 520. All insulation ends are to be tapered and sealed
22 regardless of service.

23
24 On all piping insulated with vapor barrier covering, use protection shield to over bottom one-half of
25 insulated pipe. Shield to be minimum of 12" long and 16 gauge galvanized steel. Provide
26 half-round, 12" long, hanger block at the bottom half of the pipe in place of the fiberglass pipe
27 insulation. The hanger blocks shall be molded cork or calcium silicate pipe insulation of the same
28 thickness as the adjoining fiberglass pipe insulation. The vapor barrier jacket shall be continuous
29 through the hanger location.

30
31 Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers shall
32 be sized large enough to be installed over the outer surfaces of the insulation.

33
34 Exception:

35 For insulated drain pipe, the pipe may rest directly on the hanger and the insulation to wrap
36 around the hanger and pipe.

37
38 Elastomeric thermal insulation shall be applied in accordance with manufacturer's written
39 instructions. Elastomeric foam shall not be used on exposed piping except in mechanical rooms.

40
41 Omit insulation for:

- 42 • Unions and flanges.
- 43 • Vents to atmosphere, discharges from safety and relief valves and drain pipes.

44
45 Provide finished edges at all access doors and end.

46
47
48 **PIPE INSULATION SCHEDULE**

49 Provide insulation on new and remodeled piping.

50
51
52
53
54
55 **Minimum Insulation Thickness:**

SYSTEMS	1" or less	1-1/4" to 2"	2-1/2" to 4"
Domestic Cold Water	1/2"	1/2"	1"
Domestic Hot Water	1"	1"	1-1/2"
Domestic Hot Water Return	1"	1"	1-1/2"
Non-Potable Cold Water	1/2"	1/2"	1"
Non-Potable Hot Water	1"	1"	1-1/2"
Tempered Water	1/2"	1/2"	1"

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* Provide pipe insulation on above ground horizontal storm and clearwater drain piping, underside of roof drain, and initial 5 feet of vertical conductors.

END OF SECTION

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SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 – GENERAL

- Scope
- Related Work
- Description
- Quality Assurance
- Submittals

PART 2 – PRODUCTS

- Water Distribution Pipe and Fittings
- Valves
- Unions and Flanges
- Dielectric Couplings
- Water Hammer Suppressors

PART 3 – EXECUTION

- Water Piping System
- Testing

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

- 22 05 00 – Common Work Results for Plumbing
- 22 05 14 – Plumbing Specialties
- 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

DESCRIPTION

Provide a domestic water distribution system including hot and cold water supply piping, hot water return piping, tempered water piping, pure water piping, valves, fittings, hardware, and specialties. Connect to plumbing fixtures, specialties, and equipment.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

1 **SUBMITTALS**

2 Submit valve product data sheets in accordance with Section 22 05 00 and Division 01 of the
3 Project Manual.

4
5 Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data,
6 and identification as referenced in this section and/or on the drawings.

7
8
9 **PART 2 - PRODUCTS**

10
11 **WATER DISTRIBUTION PIPE AND FITTINGS**

12
13 **Above Ground:**

14 Copper tube, Type L, hard temper, ASTM B88; with wrought copper fittings, ANSI B16.22. Join
15 using lead free flux, ASTM B813, and solder, ASTM B32.

16
17 Wrought copper, ANSI B16.22 or cast bronze, ANSI B16.18 fittings, copper tube dimensioned
18 grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted), joined with
19 mechanical couplings, synthetic rubber gasket seal, Victaulic style 607 QuickVic™ Installation
20 Ready stab-on design, for direct 'stab' installation onto roll grooved copper tube without prior field
21 disassembly and no loose parts.

22
23 **VALVES**

24 **Manufacturer:**

25 Valves throughout the project shall be by one manufacturer, unless otherwise specified.

26
27 Standard valves are based on Nibco models. Equivalent style valves as manufactured by Apollo,
28 Crane, DeZurik, Gustin-Bacon, Grinnell, Hammond, Jenkins, Lunkenheimer, Milwaukee Valve,
29 Stockham, Victaulic, or Watts are acceptable. Valves shall be of standard dimensions, comparable
30 to the number specified.

31
32 Balancing valves are based on Bell & Gossett models. Equivalent style valves by Armstrong,
33 Flowset, Nibco, Taco, or Victaulic/TA Hydronics are acceptable.

34
35 **Shutoff Valves:**

36 Except as otherwise specified, all shutoff valves 2-1/2 inch and smaller shall be ball valves and
37 shutoff valves 3 inch and larger shall be butterfly valves, unless required otherwise by local Water
38 Utility specifications.

39
40 **Ball Valves:**

41 Bronze, two piece full port ball valves with bronze body, solder or threaded ends, chromium plated
42 brass or stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at
43 600 PSI non-shock WOG, Nibco model T/S-585-70. Include handle extension for insulated piping,
44 NIB-SEAL by Nibco.

45
46 Bronze, two piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball,
47 reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG,
48 Nibco model T/S-585-70-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

49
50 Bronze, three piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball,
51 reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG,
52 Nibco model T/S-595-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

- 1 Butterfly Valves:
2 Ductile iron butterfly valve, polymid coated, EPDM elastomer coated disc, extended neck, grooved
3 ends, 300 psi WOG pressure rated, Nibco GD 4765. Include lever handle through 6-inch size and
4 gear operator for 8 inch and larger size.
5
6 Cast bronze butterfly valve, EPDM elastomer coated ductile iron disc, copper tube dimensioned
7 grooved ends, 300 psi maximum pressure rated, Victaulic Series 608. Include lever handle through
8 6-inch size.
9
- 10 **Check Valves:**
11 3" and Smaller:
12 Bronze body, Class 125, Y-pattern, swing type, check valve with solder ends, all bronze internal
13 components and renewable seat and disc, Nibco model S-413-B.
14
15 2" and Smaller:
16 Bronze body, ASTM B62, in-line lift type, spring, Buna-N disc, 250 psig WOG rating. Nibco 480
17
- 18 **Balancing Valves:**
19 ½" thru 2":
20 Bronze body balancing valve with sweat or threaded ends, calibrated brass orifice, integral
21 adjustment knob with calibrated scale, memory stop indicator, drain tapping and differential
22 pressure metering connections, Bell & Gossett "Circuit Setter".
23
- 24 **UNIONS AND FLANGES**
25 **Unions:**
26 Bronze, solder connection, Nibco figure 733.
27
28 **Flanges:**
29 Cast copper alloy, class 125, MSS SP-106, Nibco figure 741.
30
- 31 **DIELECTRIC COUPLINGS**
32 Steel casing, zinc electroplated, with inert thermoplastic lining, various end types, Clearflow, style
33 47 by Victaulic.
34
35 Dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female
36 pipe thread end connections, non-asbestos gaskets and pressure rating of not less than 175 psig
37 at 180 degrees Fahrenheit. Watts Regulator Company, Lochinvar, Wilkins, Epco Sales, Inc.
38
- 39 **WATER HAMMER SUPPRESSORS**
40 Acceptable manufacturers are MIFAB, PPP, Sioux Chief, and Watts.
41
42 Piston compressed air column type, with sealed air chamber.
43
44 Water supply piping serving fixtures, appliances, equipment and devices with quick closing and/or
45 solenoid-actuated valves shall be provided with water hammer arrestors. Also provide where
46 indicated on the water supply piping as shown on the water supply isometrics. Devices shall be
47 mechanical arrestors installed in accordance with PDI Standard WH201. Air chambers are not
48 considered to be equal.
49
50 Shop drawings are required. Submit to A/E for approval prior to installation.
51
52 Water hammer arrestors must be accessible for inspection and replacement. Provide access
53 panel.
54
55

1 **PART 3 - EXECUTION**

2
3
4 **WATER PIPING SYSTEM**

5 Piping shall be pitched to drain entire system; install drain valves at low points. Provide unions at
6 equipment and valves. Provide offsets and transition fittings as required. Avoid dips or depressions
7 in pipe runs.

8
9 No water piping shall be installed in exterior walls, unless adequately protected from freezing. Two
10 inch insulation shall be installed on back and sides of chase, front shall be open to room heat,
11 covered only by finished wall material.

12
13 Install unions, couplings, or flanges at all final equipment connections and as required to facilitate
14 removal of equipment.

15
16 Install dielectric couplings at every connection between copper pipe and other metals. Use
17 dielectric unions for connecting copper and steel piping.

18
19 Provide backflow devices as required by Code on water connections to HVAC equipment and other
20 equipment.

21
22 Extend hot water piping from water heater and connect to all fixtures and equipment as required.

23
24 Hot water and cold water lines shall be kept at least 6 inches apart whenever possible.

25
26 **Hot Water Re-Circulating System:**

27 Install return system including check valves, balancing valves, and pumps. Pitch and grade all
28 lines as required to ensure satisfactory circulation.

29
30 Adjust each balancing valve and set position stop. Balance system to minimum flow in return piping
31 branches needed to maintain even supply water temperature and to provide continuous circulation
32 throughout building. Provide balancing report along with O&M manual submittals. Test and
33 demonstrate to A/E upon request.

34
35 **Valve Installation:**

36 Install shutoff valves with stem vertical. Exception; the stem may be horizontal if a vertical
37 installation would not allow access to the valve handle

38
39 All valves with screwed ends shall be installed using "Teflon" tape applied on male portion of piping
40 fitting.

41
42 Each individual fixture or piece of equipment shall have an independent shut-off valve adjacent to
43 fixture in addition to the required branch shut-off. Where valves are installed in walls an access
44 panel shall be provided.

45
46 **Branches:**

47 Valve shut-off full size of branch for each branch take-off to supply stack or fixture group.

48
49 **Drains:**

50 Provide valved drains at low points of systems as required or directed. All piping shall be arranged
51 to drain through valved drains.

52
53 **Flushing Mains and Branch Piping:**

54 Upon completion of the water distribution system, test all valves to insure their full opening and
55 flush out the system progressively by opening drain valves and building outlets and permitting the
56 flow to continue from each until the water runs clear.

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Pipe Insulation:

Provide pipe insulation for all domestic water piping per Section 22 07 00.

Sterilization of Water Distribution System:

As soon as the water distribution system has been flushed out as above specified, it shall be sterilized in accordance with the requirements of the local Health Department/Water Utility or in the absence of such, by the following method:

Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine, as determined by residual chlorine tests at the ends of the lines. Open and close all valves and hydrants while the system is being chlorinated.

After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 5 PPM as indicated, repeat the sterilization process.

When tests show at least 5 PPM of residual chlorine flush out the system until all traces of the chemical used are removed.

Samples

After disinfecting the water distribution system, take water samples to check for bacteria. Take 5 water samples from remote faucets, plus the main entrance. Send the samples to the Wisconsin Department of Health Lab to sample for a safe water supply system.

END OF SECTION

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SECTION 22 13 00
FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 – GENERAL

- Scope
- Related Work
- Description
- Quality Assurance
- Submittals

PART 2 – PRODUCTS

- Underground Pipe Fittings
- Above Ground Pipe and Fittings
- Drains and Cleanouts

PART 3 - EXECUTION

- Drain and Vent Piping System
- Pipe Joints
- Cleanouts
- Traps
- Testing

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

- 22 05 00 – Common Work Results for Plumbing
- 22 05 14 – Plumbing Specialties
- 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

DESCRIPTION

Interior sanitary waste and vent and acid drain and vent piping systems including branches, drains, cleanouts, stacks, fittings and hardware.

Work under this section shall commence from 5 feet outside the building wall with connections to sanitary building sewer lateral(s).

QUALITY ASSURANCE

Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

SUBMITTALS

Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.

1
2 Schedule from the contractor indicating the ASTM, or CISPI specification number of the pipe being
3 proposed along with its type and grade, and sufficient information to indicate the type and rating of
4 fittings for each service.

5
6 Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data,
7 and identification as referenced in this section and/or on the drawings.
8
9

10 **PART 2 - PRODUCTS**

11 **UNDERGROUND PIPE AND FITTINGS**

12 Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM
13 C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall be marked with the collective
14 trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping and
15 fittings shall be manufactured by AB&I, Charlotte, or Tyler.
16

17
18 Cast iron soil pipe, bell and spigot, service weight, coated, ASTM A74, with rubber gaskets, ASTM
19 C564. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe
20 Institute or receive prior approval of the engineer. Piping and fittings shall be manufactured by
21 AB&I, Charlotte, or Tyler.
22

23 PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with
24 solvent weld joints, ASTM D2855. Solid wall PVC only.
25

26 **ABOVE GROUND PIPE AND FITTINGS**

27 Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM
28 C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall be marked with the collective
29 trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping and
30 fittings shall be manufactured by AB&I, Charlotte, or Tyler.
31

32 PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with
33 solvent weld joints, ASTM D2855. Solid wall PVC only.
34

35 **Optional Materials for Piping 2" and Smaller:**

36 Copper drainage tube, Type DWV, ASTM B-306; wrought copper and cast brass drainage fittings
37 with soldered joints.
38

39 Galvanized steel pipe, ASTM A53 or A120; galvanized cast iron threaded DWV fittings ANSI B16.4
40 and ANSI B16.12.
41

42 **DRAINS AND CLEANOUTS**

43 Drains and cleanouts manufactured by J.R. Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or
44 Zurn.
45

46 Refer to Plumbing Drain and Cleanout Schedule.
47
48
49

50 **PART 3 - EXECUTION**

51 **DRAIN AND VENT PIPING SYSTEM**

52 Connect all drain and vent piping to each fixture and piece of equipment and install all required
53 piping as shown on drawings. Provide all necessary fittings and hardware to make required offsets
54 and transitions.
55
56

1 Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes,
2 long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.

3
4 Fittings to be installed to make for the least possibility of stoppage. All horizontal drainage piping
5 less than 3 inches shall be pitched a minimum of 1/4 inch per foot of run. Pitch drainage piping 3
6 inch and larger a minimum of 1/8" per foot of run.

7
8 When running drain piping below a footing and parallel to it, piping shall be in all cases be at least
9 one foot greater in distance away from footing than below its bottom. Where possible, run sewers
10 at centerpoint between two parallel footings and maintain above-mentioned distances at a
11 minimum. When running drain piping under a footing, disturb as little of the soil under footing as
12 possible. Provide concrete fill under all footings where excavations wider than 18" are required.

13
14 When running drain piping through a footing, provide a steel pipe sleeve with 2" thick minimum
15 compressible wrap.

16
17 Connect to all drains, fixtures and equipment as required.

18 19 **PIPE JOINTS**

20 Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards 301, 310,
21 and in their publication "Installation Suggestions for Cast Iron No-Hub Pipe and Fittings".

22
23 Prepare PVC pipe ends as recommended by manufacturer. Use a P-70 type primer (for PVC) and
24 a PVC solvent cement appropriate to the pipe size and temperature range.

25
26 Soldered joints shall be as described in Section 22 05 00.

27 28 **VENT FLASHING**

29 All vent pipes passing through roof shall be covered with sheet lead weighing not less than 4
30 pounds per square foot. Sheet lead shall be well flashed onto the roof, 12" around pipe. Vent
31 pipes shall extend a minimum of 12" above roof.

32 33 **CLEANOUTS**

34 Provide and install cleanouts as shown on plans and as required by Code.

35 36 **TRAPS**

37 Trap all fixtures and equipment. Trap seals shall be standard depth, except when deep seals are
38 required by Code. Traps shall be set true and level and located within the limits of the Code
39 requirements. A trap shall not be used as a separator, interceptor or other type of device to retain
40 solids. All traps above grade shall be provided with approved screw-type cleanout plugs.

41
42 Traps shall be protected during construction and sealed to prevent foreign matter from entering.
43 Provide adjustable expansion plug, plastic cap, or approved equivalent.

44 45 **TESTING**

46 Refer to Testing paragraph of Section 22 05 00.

47
48 Hydro-statically pressure test all piping to 10 feet of water column pressure for 2 hours. No leaks
49 allowed. Provide mint test of entire system as required by local inspector.

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END OF SECTION

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SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

SCOPE

This section includes specifications for plumbing fixtures, faucets and trim for this project. Included are the following topics:

PART 1 – GENERAL

- Scope
- Related Work
- Description
- Reference Standards
- Quality Assurance
- Submittals

PART 2 – PRODUCTS

- General
- Manufacturers

PART 2 - EXECUTION

- Installation

RELATED WORK

Requirements of Division 01 shall govern work under this Section.

- Division 11 - Foodservice Equipment
- Section 22 05 00 – Common Work Results for Plumbing
- Section 22 05 14 - Plumbing Specialties
- Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment
- Section 22 11 00 - Facility Water Distribution
- Section 22 13 00 - Facility Sanitary Sewerage

DESCRIPTION

Furnish and install plumbing fixtures with traps, drains, stops, faucets, flush valves, carriers and hardware.

REFERENCE STANDARDS

ANSI A112.6.1M-88	Supports for Off-the Floor Plumbing Fixtures for Public Use.
ANSI A112.18.1-94	Finished and Rough Brass Plumbing Fixture Fittings.
ANSI A112.19.1-90	Enameled Cast Iron Plumbing Fixtures.
ANSI A112.19.2M-82	Vitreous China Plumbing Fixtures.
ANSI A112.19.5-79(R1990)	Trim for Water Closet Bowls, Tanks and Urinals.
ANSI Z124.1-87	Plastic Bathtub Units.
ANSI Z124.2-87	Plastic Shower Receptors and Shower Stalls.
ARI-1010-94	Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
ASSE 1011-93	Hose Connection Vacuum Breakers.
ASSE 1014-90	Handheld Showers.
ASSE 1035-93	Laboratory Faucet Backflow Preventers.

QUALITY ASSURANCE

Substitution of Materials: Refer to 22 05 00 and Division 01 of the Project Manual.

1 Plumbing products requiring approval by the State of Wisconsin Dept. of Commerce must be
2 approved or have pending approval at the time of shop drawing submission.

3
4 **SUBMITTALS**

5 Submit product data sheets in accordance with Division 01 and Section 22 05 00.

6
7 Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of
8 construction, ratings, weights, trim, finishes, manufacturer's installation requirements,
9 manufacturer's performance limitations, and appropriate identification.

10
11
12 **PART 2 - PRODUCTS**

13
14 **GENERAL**

15 Fixtures must conform to general requirements given below and to specified requirements for each
16 type.

17
18 Vitreous china fixtures shall conform to ANSI A112.19.2M.

19
20 Enameled cast iron fixtures shall conform to ANSI A112.19.1M.

21
22 Stainless steel fixtures shall conform to ANSI A112.19.3.

23
24 Fixtures shall be installed so that parts are accessible for repairs when fixtures are in place.
25 Manufacturer's trademark or name shall be visible on fixtures.

26
27 Faucets, traps, exposed fittings and trim shall be polished chrome plated unless otherwise
28 specified. Provide polished chrome plated nipples at all lavatories.

29
30 Exposed piping penetrating walls, floors or ceilings shall have chrome plated escutcheons, or
31 flanges of sufficient depth to seal the opening.

32
33 Fixture stops shall be heavy duty commercial grade, slow compression angle valves with 1/2" inlet
34 and 3/8" or 1/2" chrome plated flexible riser.

35
36 Traps shall be semi-cast 17-gauge brass, chrome plated, with cleanout and escutcheon. Sink traps
37 shall be 1-1/2" minimum.

38
39 **MANUFACTURERS**

40 Vitreous china and enameled cast iron fixtures shall be manufactured by American-Standard, Eljer, Kohler,
41 Sloan, Toto, or Zurn. Fixture color shall be white unless specified otherwise.

42
43 Flush valves shall be manufactured Sloan ("Royal" series), or Zurn ("Aquavantage" series) Kohler
44 manual.

45
46 Solid plastic toilet seats shall be manufactured by Bemis, Benneke, Centoco, Church, Olsonite, Kohler, or
47 Zurn. Seat color shall match fixture unless specified otherwise.

48
49 Carriers for wall-mounted fixtures shall be manufactured by J.R. Smith, Josam, MIFAB, Wade, Watts, or
50 Zurn.

51
52 Solid surface handwashing stations shall be manufactured by Acorn, Bradley, Intersan, or Willoughby.

53
54 Electronic sensor operated faucets shall be manufactured by Bradley, Chicago Faucet, Kohler, Sloan,
55 Speakman, or Zurn.

1 Shower mixing valves and accessories shall be manufactured by American Standard, Chicago Faucet,
2 Kohler, Leonard, Powers, Speakman, Symmons, or Zurn.
3
4 Heavy duty stops and supplies shall be manufactured by Chicago Faucet, Dearborn, EBC, Kohler,
5 McGuire, T&S Brass, or Zurn.
6
7 Lavatory drains shall be offset type, 1-1/4" size, with flat grid strainer, manufactured by Dearborn, EBC,
8 Keeney, Kohler, McGuire, or Zurn.
9
10 Traps shall be semi-cast 17 gauge brass, chrome plated, with cleanout and escutcheon as manufactured
11 by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.
12
13 Supply, drain and trap insulating kits shall be manufactured by Brocar, EBC, McGuire, Plumberex, or
14 Truebro.

15
16 **Fixtures:**

17 See Plumbing Fixture Schedule on drawings for type, manufacturer, and model for fixtures.
18
19

20 **PART 3 - EXECUTION**

21
22 **INSTALLATION**

23 Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb.
24 Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt
25 fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed
26 piping.

27
28 Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in
29 readily accessible location for servicing. Individual supplies to fixtures shall be provided with
30 support to prevent movement.

31
32 Install barrier free fixtures in compliance with COMM 52, 69 and Federal ADA Accessibility
33 Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops
34 elevated to avoid contact by wheelchair users.

35
36 Seal joints between countertop, wall, floor and fixtures with G.E. Silicone caulk; white, clear or color
37 to match fixture with colored caulk by fixture manufacturer.

38
39 Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy
40 duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are
41 not acceptable.

42
43 Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be
44 chrome plated brass, same items in concealed locations may be of rough brass finish.

45
46 After installation, fixtures shall be protected to prevent scratching or other damage during
47 construction.

48
49 Prior to acceptance, fixtures shall be cleaned with compounds recommended by the respective
50 manufacturer.

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SECTION 23 01 30.51
HVAC AIR DUCT CLEANING

PART 1 - GENERAL

SCOPE

This section includes specifications for cleaning duct and HVAC systems on this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS

- General
- Cleaners
- Equipment
- Access Doors

PART 3 - EXECUTION

- General
- Cleaning
- Cleaning Report
- Access Doors

RELATED WORK

- Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- Section 23 31 00 - HVAC Ducts and Casings
- Section 23 33 00 - Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

NADCA 1992-01	Mechanical Cleaning of Non-Porous Air Conveyance System Components
	National Air Duct Cleaners Association
NADCA	Understanding Microbial contamination in HVAC Systems
NAIMA	Cleaning Fibrous Glass Insulated Air Duct Systems

QUALITY ASSURANCE

Refer to Division 1, Instructions to Bidders – Qualifications of Bidder and General Conditions - Equals and Substitutions.

A Regular Member in good standing of NADCA (National Air Duct Cleaners Association). Maintain membership for the entire duration of the project. Maintain a staff of at least one Certified Air System Cleaning Specialist (ASCS). If membership of the firm, or any certification of any staff performing work is terminated or expires during the duration of the project, contact DFD immediately.

SHOP DRAWINGS

Refer to Division 1, General Conditions, Submittals.

1
2 Include manufacturer's data and/or Contractor data for the following:
3

- 4 • List of equipment to be used.
- 5
- 6 • Product description and MSDS sheets for cleaners, biocides and encapsulants.
- 7
- 8 • Access doors.
- 9

10
11
12 **PART 2 - PRODUCTS**
13

14 **GENERAL**

15 Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke
16 developed rating no higher than 50.

17
18 **CLEANERS**

19 Manufacturer: H.B. Fuller/Foster, Porter or approved equal.

20
21 Cleaners shall be waterbase products specifically designed for application to HVAC duct interiors and
22 capable of being applied with airless spray equipment.

23
24 **EQUIPMENT**

25 Particulate Collection Equipment: Fan/filter unit sized to create sufficient quantity of negative pressure for
26 capture and filtration of air and contaminants dislodged during duct cleaning. Equipment to include
27 prefiltration and HEPA final filtration with 99.97% collection efficiency for 0.3 micron size particles.

28
29 Portable pressure washers to be capable of 500 psig to 1000 psig operation.

30
31 Power brush systems designed specifically for duct cleaning.
32
33

34 **PART 3 - EXECUTION**
35

36 **GENERAL**

37 Use products and equipment in accordance with manufacturers instructions.

38
39 **CLEANING**

40 Clean ductwork systems and associated turning vanes as described below:
41

42 <u>System/Component</u>	43 <u>Location</u>	44 <u>Action</u>
45 Return Duct Systems 46 (AC-1 (E), AC-4 (E))	47 As shown on plans	48 Clean

49 Visually inspect systems and site prior to cleaning. Document and report damaged system components to
50 Owner's Construction Representative prior to cleaning. Mark damper and other component positions prior
51 to cleaning and reset after cleaning to original position. Establish a specific, coordinated plan detailing how
52 each area of the building will be protected during the various phases of work.

53 Protect building occupants, components and furnishings from cleaning activities. Use polyethylene sheeting
54 covers and barriers where cleaning will disperse debris outside the HVAC systems. Install critical barriers
55 within the building, at inlets/outlets and within the system to prevent migration of dust and debris to clean
areas.

1 Use particulate collection equipment to remove and capture debris. Connect to system downstream of
2 cleaning operations. Wherever possible, duct exhaust to the exterior of the building. Avoid discharge near
3 air intakes and points of entry. Arrange source of makeup air to flow from clean area to work area
4 negatively pressurizing work area. Take measures to control offensive odors and vapors during the cleaning
5 process.

6
7 Clean systems using mechanical cleaning methods, such as vacuum cleaning, compressed air sweeping and
8 mechanical brushing, designed to extract contaminants from within the HVAC system and safely remove
9 contaminants from the facility. No cleaning methods are to be used which damage components of the
10 system or negatively alter the integrity of the system.

11
12 Verification of HVAC system cleanliness will be performed after cleaning. The Contractor shall notify the
13 Owner's Construction Representative and Architect/Engineer in advance of verification. Verification will
14 consist of inspection by the Contractor, Owner's Construction Representative and/or Architect/Engineer. If
15 surfaces are visibly clean, no contaminants are evident through visual inspection, the HVAC system shall
16 be considered clean. However, the Owner reserves the right to further verify system cleanliness through
17 third party gravimetric or wipe testing analysis per NADCA standards.

18
19 **CLEANING REPORT**
20 Provide a report describing pre-cleaning inspection and damage, systems cleaned, methods and materials
21 used, problems encountered, final verification and any remaining problems noted. Submit three copies to
22 Owner's Construction Representative.

23
24 **ACCESS DOORS**
25 Install access doors where indicated on the drawings and in locations where access is required for cleaning
26 or inspection. See specification Section 23 33 00 for access door requirements.

27
28 Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access
29 door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as
30 indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted
31 coils if not existing.

32
33 **END OF SECTION**

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SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

SCOPE

This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing
- Submittals
- Off Site Storage
- Certificates and Inspections
- Operating and Maintenance Data
- Training of Owner Personnel
- Record Drawings
- Cleaning
- Warranty

PART 2 - PRODUCTS

- Access Panels and Doors
- Identification
- Sealing

PART 3 - EXECUTION

- Demolition
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Lubrication
- Sleeves and Openings
- Sealing
- Owner Training

RELATED WORK

- Section 07 84 00 - Fire Stopping
- Section 23 05 13 - Common Motor Requirements for HVAC.
- Section 23 33 00 - Air Duct Accessories.

REFERENCE

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

1 **REFERENCE STANDARDS**

2 Abbreviations of standards organizations referenced in other sections are as follows:

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AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
EPA	Environmental Protection Agency
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
UL	Underwriters Laboratories Inc.
ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials

31 **QUALITY ASSURANCE**

32 Refer to Division 1, General Conditions, Equals and Substitutions.

33
34 Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings,
35 or engineering parameters from those indicated on the contract documents, the contractor is responsible for
36 all costs involved in integrating the equipment or accessories into the system and for obtaining the
37 performance from the system into which these items are placed. This may include changes found necessary
38 during the testing, adjusting, and balancing phase of the project.

39
40 **CONTINUITY OF EXISTING SERVICES**

41 Do not interrupt or change existing services without prior written approval from the Project Representative.
42 When interruption is required, coordinate the down-time with the user agency to minimize disruption to
43 their activities. Unless specifically stated, all work involved in interrupting or changing existing services is
44 to be done during normal working hours.

45
46 **PROTECTION OF FINISHED SURFACES**

47 Refer to Division 1, General Requirements, Protection of Finished Surfaces.

48
49 Furnish one can of touch-up paint for each different color factory finish which is to be the final finished
50 surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the
51 General Requirements.

52
53 **SLEEVES AND OPENINGS**

54 Refer to Division 1, General Requirements, Sleeves and Openings.

1 **SEALING**
2 Sealing of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening
3 shall be the responsibility of the contractor whose work penetrates the opening.
4

5 **SUBMITTALS**

6 Refer to Division 1, General Conditions, Submittals.
7

8 Submit for all equipment and systems as indicated in the respective specification sections, marking each
9 submittal with that specification section number. Mark general catalog sheets and drawings to indicate
10 specific items being submitted and proper identification of equipment by name and/or number, as indicated
11 in the contract documents.
12

13 Before submitting electrically powered equipment, verify that the electrical power and control requirements
14 for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a
15 statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the
16 motor starter schedules are in agreement or indicate any discrepancies. See related comments in Section
17 23 05 13 in Part 1 under Electrical Coordination.
18

19 Include wiring diagrams of electrically powered equipment.
20

21 Submit sufficient quantities of shop drawings to allow the following distribution:

- 22 • Operating and Maintenance Manuals 2 copies
 - 23 • Testing, Adjusting and Balancing Contractor 1 copy
 - 24 • A/E 1 copy
- 25

26 **OFF SITE STORAGE**

27 Prior approval by the A/E will be needed. The contractor shall submit Storage Agreement Form for
28 consideration of off site materials storage.
29

30 Generally, ductwork, metal for making ductwork, duct lining, sleeves, pipe/pipe fittings and similar
31 rough-in material will not be accepted for off site storage. For material that can be stored off site, no
32 material will be accepted for off site storage unless shop drawings for that material have been approved.
33

34 **CERTIFICATES AND INSPECTIONS**

35 Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.
36

37 Obtain and pay for all required State installation inspections except those provided by the
38 Architect/Engineer in accordance with code. Deliver originals of these certificates to the Division Project
39 Representative. Include copies of the certificates in the Operating and Maintenance Instructions.
40

41 **OPERATION AND MAINTENANCE DATA**

42 All operations and maintenance data shall comply with the submission and content requirements specified
43 under section GENERAL REQUIREMENTS.
44

45 In addition to the general content specified under GENERAL REQUIREMENTS supply the following
46 additional documentation:

- 47 1. Records of tests performed a to certify compliance with system requirements
- 48 2. Certificates of inspection by regulatory agencies
- 49 3. Valve schedules
- 50 4. Lubrication instructions, including list/frequency of lubrication
- 51 5. Copies of all approved shop drawings.
- 52 6. Manufacturer's wiring diagrams for electrically powered equipment
- 53 7. Temperature control record drawings and control sequences
- 54 8. Parts lists for manufactured equipment
- 55 9. Warranties
- 56 10. Additional information as indicated in the technical specification sections

1 Provide (3) hard copies of the Operation and Maintenance Manual. Manuals shall be organized in three
2 ring binders with dividers and reference tabs. Manuals shall be delivered as follows:
3

4 Provide three (3) electronic (Adobe PDF) copies of the Operation and Maintenance Manual.

- 5 1. Provide each copy on a separate portable USB flash drive.

6 7 **TRAINING OF OWNER PERSONNEL**

8 Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided
9 as part of this project. Include not less than 8 hours of instruction, using the Operating and Maintenance
10 manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All
11 training to be during normal working hours.
12

13 **RECORD DRAWINGS**

14 Refer to Division 1, General Requirements, Record Drawings.
15

16 Maintain accurate as-built or record drawings throughout the duration of the project. As-built drawings
17 shall be available on site at all times for review by the A/E or owner.
18

19 If, during project closeout, the A/E or owner observes installations that are not accurately recorded on the
20 as-built or record drawings, the record drawings will not be accepted and the contractor will be required, at
21 their own expense, to provide updated and accurate record drawings.
22

23 In addition to the data indicated in the General Requirements, maintain temperature control record
24 drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record
25 drawings with the Operating and Maintenance manuals.
26

27 **CLEANING**

28 Keep the premises broom clean and free of surplus materials, rubbish and debris.
29

30 Clean all equipment, piping, duct, strainers, filters, etc. prior to building turnover to owner. All systems
31 shall be turned over to owner in condition ready for operation.
32

33 **WARRANTY**

34 Warrant that work shall function for one year immediately following the acceptance of the system(s). The
35 date of acceptance shall be an agreed upon date by all parties, including Division 23 contractor, General
36 Contractor, Owner, Tenant and A/E.
37

38 Keep the system in good working order at no expense, unless defects are clearly the result of improper
39 usage.
40

41 Warranty calls shall be at no cost to the owner.
42

43 Submit for acceptance of the work, written certification that the entire system has been installed and
44 adjusted for operation in accordance with the Contract Documents.
45

46 47 **PART 2 - PRODUCTS**

48 49 50 **ACCESS PANELS AND DOORS**

51 52 **LAY-IN CEILINGS:**

53 Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Section 09500 are
54 sufficient; no additional access provisions are required unless specifically indicated.
55
56

1 PLASTER WALLS AND CEILINGS:

2 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general
3 applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver
4 operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated
5 partitions if required by the application. Use the largest size access opening possible, consistent with the
6 space and the equipment needing service; minimum size is 12" by 12".

7
8 **IDENTIFICATION**

9 **STENCILS:**

10 Not less than 1 inch high letters/numbers for marking pipe and equipment.

11
12 **SNAP-ON PIPE MARKERS:**

13 Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without
14 the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for
15 piping marking. W. H. Brady, Seton, Marking Services, or equal.

16
17 **ENGRAVED NAME PLATES:**

18 White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting,
19 Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by
20 Marking Services, or W. H. Brady.

21
22 **VALVE TAGS:**

23 Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum
24 diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co.,
25 Seton Name Plate Company, Marking Services, or W. H. Brady.

26
27 **SEALING**

28
29 **NON-RATED PENETRATIONS:**

30
31 **Pipe Penetrations:**

32 At pipe penetrations of non-rated interior walls, floors and exterior walls above grade, use urethane caulk in
33 annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood walls where
34 sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

35
36 **Duct Penetrations:**

37 Annular space between duct (with or without insulation) and the non-rated walls or floor opening shall not
38 be larger than 2". Where existing openings have an annular space larger than 2", the space shall be patched
39 to match existing construction to within 2" around the duct.

40
41 Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation.
42 Provide 4" sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.

43
44
45 **PART 3 - EXECUTION**

46
47 **DEMOLITION**

48 Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to
49 be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition
50 to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not
51 reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with
52 the user agency to minimize disruption to the existing building occupants.

53
54 All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or
55 deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to
56 be removed from the site by the Contractor unless they are dismantled and removed or stored by the user

1 agency. All designated equipment is to be turned over to the user agency for their use at a place and time
2 so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to
3 that existing before work began.

4 5 **CUTTING AND PATCHING**

6 Refer to Division 1, General Requirements, Cutting and Patching.

7 8 **BUILDING ACCESS**

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

12 13 **EQUIPMENT ACCESS**

14 Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and
15 service. Coordinate the exact location of wall and ceiling access panels and doors with the General
16 Contractor, making sure that access is available for all equipment and specialties. Access doors in general
17 construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.

18
19 Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which
20 do not require access panels.

21 22 **COORDINATION**

23 Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not
24 limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units
25 installed in/on architectural surfaces.

26
27 Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated
28 and that interferes with other contractor's work shall be removed or relocated at the installing contractor's
29 expense.

30
31 Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify
32 system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of
33 liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, duct
34 and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.),
35 ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow
36 measuring devices, gauges, temperature controls, etc., required for functional and balanced systems.
37 Demonstrate the starting, interlocking and control features of each system so the test and balance agency
38 can perform its work.

39 40 **IDENTIFICATION**

41 Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one
42 coat of black enamel against a light background or white enamel against a dark background. Use a primer
43 where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans
44 in occupied spaces.

45
46 Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

47
48 Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access
49 door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs.
50 Pipe shall be labeled with:

- 51 • Pipe content (LPS, LPC, CCC, etc.).
- 52 • Pipe flow direction.
- 53 • Pipe size.

54
55 Use one coat of black enamel against a light background or white enamel against a dark background for
56 stenciling, or provide snap-on pipe markers as specified in Part 2 – Products.

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Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms to be framed under clear plastic.

Use engraved name plates to identify control equipment.

LUBRICATION

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

SLEEVES AND OPENINGS

Pipe penetrations in existing concrete floors: Core drill openings.

Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

DUCT SLEEVES:

Duct sleeves are not required in non-rated partitions or floors.

SEALING

NON-RATED PENETRATIONS:

At all interior walls and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

Duct penetrations through non-rated partitions shall require sheet metal escutcheons with fiberglass or mineral wool insulation fill for spaces that include laboratories, clean rooms, animal rooms, kitchens, cart wash rooms, janitor closets, toilet rooms, mechanical rooms, conference rooms, private consultation rooms, where ducts are exposed and where noted on drawings elsewhere.

PENETRATIONS SUBJECT TO WATER INTRUSION:

For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:

- Pipe penetration where steel pipe sleeve is used extend steel sleeve 2" above the floor.
- Pipe penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2"x 2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8" on center. Seal corners water tight with urethane caulk.

Floors subject to water intrusion or rooms housing electrical equipment include the following locations:

- Locker/Shower Rooms

OWNER TRAINING

All training provided for Owner shall comply with the format, general content requirements and submission guidelines.

END OF SECTION

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SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

SCOPE

This sections includes requirements for single and three phase motors that are used with equipment specified in other sections. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operating and Maintenance Data
- Electrical Coordination
- Product Criteria

PART 2 - PRODUCTS

- Three Phase, Single Speed Motors
- Single Phase, Single Speed Motors

PART 3 - EXECUTION

- Installation

RELATED WORK

Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC
Division 26 00 00 - Electrical

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
ANSI/NEMA MG-1	Motors and Generators
ANSI/NFPA 70	National Electrical Code

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include with the equipment which the motor drives the following motor information: motor manufacturer, horsepower, voltage, phase, hertz, rpm, full load efficiency. Include project wiring diagrams prepared by the contractor specifically for this work.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

- 1 1. Lubrication instructions, including list/frequency of lubrication
- 2 2. Table noting full load power factor, service factor, NEMA design designation, insulation class and
- 3 frame type for each motor provided

4 5 **ELECTRICAL COORDINATION**

6 All starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, pushbuttons,
7 pilot lights, and other devices required for the control of motors or electrical equipment are furnished and
8 installed by the Electrical Contractor, except as specifically noted elsewhere in this division of
9 specifications.

10
11 Electrical drawings and/or specifications show number and horsepower rating of all motors furnished by
12 this Contractor, together with their actuating devices if these devices are furnished by the Electrical
13 Contractor. Should any discrepancy in size, horsepower rating, electrical characteristics or means of
14 control be found for any motor or other electrical equipment after contracts are awarded, Contractor is to
15 immediately notify the architect/engineer of such discrepancy. Costs involved in any changes required due
16 to equipment substitutions initiated by this contractor will be the responsibility of this contractor. See
17 related comments in Section 23 05 00 - Common Work Results for HVAC, under Shop Drawings.

18
19 Electrical Contractor will provide all power wiring and control wiring, except temperature control wiring.

20
21 Furnish project specific wiring diagrams to Electrical Contractor for all equipment and devices furnished
22 by this Contractor and indicated to be wired by the Electrical Contractor.

23 24 **PRODUCT CRITERIA**

25 Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be
26 listed by U.L. for the service specified.

27
28 Select motors for conditions in which they will be required to perform; i.e., general purpose, splash proof,
29 explosion proof, standard duty, high torque or any other special type as required by the equipment or motor
30 manufacturer's recommendations.

31
32 Furnish motors for starting in accordance with utility requirements and compatible with starters as
33 specified.

34 35 36 **PART 2 - PRODUCTS**

37 38 **THREE PHASE, SINGLE SPEED MOTORS**

39 Use NEMA rated 460 volt, three phase, 60 hertz motors for all motors 1/2 HP and larger unless specifically
40 indicated.

41
42 Use NEMA general purpose, continuous duty, Design B, normal starting torque, T-frame or U-frame
43 motors with Class B or better insulation unless the manufacturer of the equipment on which the motor is
44 being used has different requirements. Use open drip-proof motors unless totally enclosed fan-cooled,
45 totally enclosed non-ventilated, explosion-proof, or encapsulated motors are specified in the equipment
46 sections.

47
48 Use grease lubricated anti-friction ball bearings with housings equipped with plugged/capped provision for
49 relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with
50 NEMA minimum V-belt pulley with belt center line at the end of NEMA standard shaft extension. Stamp
51 bearing sizes on nameplate.

52
53 All open drip-proof motors to have a 1.15 service factor. Other motor types may have minimum 1.0
54 service factors.

1 All motors 1 HP and larger, except specially wound motors and inline pump motors 56 frame and smaller,
 2 to be high efficiency design with full load efficiencies which meet or exceed the values listed below when
 3 tested in accordance with NEMA MG 1.

4
 5 **FULL LOAD NOMINAL MOTOR EFFICIENCY BY MOTOR SIZE AND SPEED**

6 -----Open Drip-Proof Motors-----
 7 -----Nominal Motor Speed-----

MOTOR HP	1200 rpm	1800 rpm	3600 rpm
1	82.5	85.5	77.0
1-1/2	86.5	86.5	84.0
2	87.5	86.5	85.5

13 ----Totally Enclosed Fan-Cooled----
 14 -----Nominal Motor Speed-----

MOTOR HP	1200 rpm	1800 rpm	3600 rpm
1	82.5	85.5	77.0
1-1/2	87.5	86.5	84.0
2	88.5	86.5	85.5

19
 20 **SINGLE PHASE, SINGLE SPEED MOTORS**

21 Use NEMA rated 208 volt, single phase, 60 hertz motors for all motors 1/3 HP and smaller or for
 22 equipment as scheduled.

23
 24 Use permanent split capacitor or capacitor start, induction run motors equipped with permanently
 25 lubricated and sealed ball or sleeve bearings and Class A insulation. Service factor to be not less than 1.35.

26
 27 **PART 3 - EXECUTION**

28
 29 **INSTALLATION**

30 Mount motors on a rigid base designed to accept a motor, using shims if required under each mounting foot
 31 to get a secure installation.

32
 33 When motor will be flexible coupled to the driven device, mount coupling to the shafts in accordance with
 34 the coupling manufacturer's recommendations. Using a dial indicator, check angular misalignment of the
 35 two shafts; adjust motor position as necessary so that the angular misalignment of the shafts does not
 36 exceed 0.002 inches per inch diameter of the coupling hub. Again using the dial indicator, check the shaft
 37 for run-out to assure concentricity of the shafts; adjust as necessary so that run-out does not exceed 0.002
 38 inch.

39
 40 When motor will be connected to the driven device by means of a belt drive, mount sheaves on the
 41 appropriate shafts in accordance with the manufacturer's instructions. Use a straight edge to check
 42 alignment of the sheaves; reposition sheaves as necessary so that the straight edge contacts both sheave
 43 faces squarely. After sheaves are aligned, loosen the adjustable motor base so that the belt(s) can be added
 44 and tighten the base so that the belt tension is in accordance with the drive manufacturer's
 45 recommendations. Frequently recheck belt tension and adjust if necessary during the first day of operation
 46 and again after 80 hours of operation.

47
 48 Verify the proper rotation of each three-phase motor as it is being wired or before the motor is energized
 49 for any reason.

50
 51 Lubricate all motors requiring lubrication. Record lubrication material used and the frequency of use.
 52 Include this information in the maintenance manuals.

53
 54
 55 **END OF SECTION**

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SECTION 23 05 15
PIPING SPECIALTIES

PART 1 - GENERAL

SCOPE

This section contains specifications for HVAC piping specialties for all piping systems. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- Test Wells
- P/T (Pressure/Temperature) Test Plugs
- Hose Connection Caps
- Pressure Gauges
- Strainers
- Steam Traps
- Vacuum Breakers

PART 3 - EXECUTION

- Test Wells
- P/T (Pressure/Temperature) Test Plugs
- Pressure Gauges
- Strainers
- Steam Traps
- Vacuum Breakers

RELATED WORK

- Section 23 05 23 - General-Duty Valves for HVAC Piping
- Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- Section 23 07 00 - HVAC Insulation
- Section 23 22 13 - Steam and Condensate Heating Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Required for all items in this section; Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1 **OPERATION AND MAINTENANCE DATA**

2 All operations and maintenance data shall comply with the submission and content requirements specified
3 under section GENERAL REQUIREMENTS.

4
5 **DESIGN CRITERIA**

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

8
9
10 **PART 2 - PRODUCTS**

11
12 **TEST WELLS**

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

16
17 **P/T (PRESSURE/TEMPERATURE) TEST PLUGS**

18 Brass plug with 1/4" NPT threads, EPDM or neoprene valve core, knurled cap with cap strap. Use
19 extended length plugs to clear insulated piping. Adaptors shall have 1/4" FPT connection for standard
20 pressure gauges.

21
22 **HOSE CONNECTION CAPS**

23 Hose connection caps shall be pressure rated for 150 psig at 180 deg F.

24
25 **PRESSURE GAUGES**

26 Manufacturers: Ametek/U. S. Gauge Division, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Weksler.

27
28 Cast aluminum case of not less than 4.5 inches in diameter, double strength glass window, black lettering
29 on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of
30 the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale,
31 with scale range as follows:

<u>Service</u>	<u>Scale Range, psig</u>	<u>Min. Increment, psig</u>
Low Pressure Steam	0 - 30	0.5

32
33 **Pressure Snubbers:**

34 Bronze construction, suitable for system working pressure, 1/4" size.

35
36 **Coil Syphons:**

37 Bronze or steel construction, suitable for system working pressure, 1/4" size.

38
39 **Gauge Valves:**

40 Use valves as specified in Section 23 05 23 - General-Duty Valves for HVAC Piping. For water systems,
41 use 1/4" ball valves. For steam systems, use 1/4" gate valves suitable for system working pressure.

42
43 **STRAINERS**

44 Manufacturers: Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

45
46 **STEAM SYSTEMS (15 PSIG AND LOWER):**

47 Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blow off
48 valve; threaded in sizes through 2 inch and rated at not less than 250 psi at 400°F; flanged in sizes over 2
49 inch and rated at not less than 125 psi at 350°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.050
50 inch perforations for line sizes over 2 inch.

1 **STEAM TRAPS**

2 Manufacturers: Armstrong, Dunham-Bush, Hoffman, Illinois, Nicholson, Spirax Sarco, TLV and Yarway.
3 Manufacturers must meet the material specifications below.

4
5 Minimum trap size is 3/4 inch for all types.

6
7 Traps with brass/bronze internal parts will not be accepted.

8
9 **FLOAT AND THERMOSTATIC TRAPS:**

10 Cast iron or semi-steel body and bolted cover, non-asbestos cover gasket, stainless steel bellows type air
11 vent, stainless steel float, stainless steel lever and valve assembly, and rated at not less than [125 psig
12 saturated steam][15 psig saturated steam]. Traps used on low pressure steam, 15 psig or less, are to be
13 SHEMA rated.

14
15 **VACUUM BREAKERS**

16 Where vacuum breakers are not furnished integral with equipment by the equipment manufacturer, provide
17 15 degree swing check valve. Reference specification section 23 05 23.

18
19
20 **PART 3 - EXECUTION**

21
22 **TEST WELLS**

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

25
26 **P/T (PRESSURE/TEMPERATURE) TEST PLUGS**

27 Install in piping systems as indicated on the drawings and/or details. Do not insulate over test plugs.

28
29 **PRESSURE GAUGES**

30 Install in locations where indicated on the drawings and/or details, including any gauge piping, with scale
31 range appropriate to the system operating pressures.

32
33 **PRESSURE SNUBBERS:**

34 Install in gauge piping for all gauges used on water services.

35
36 **COIL SYPHONS:**

37 Install in gauge piping for all gauges used on steam services.

38
39 **GAUGE VALVES**

40 Install at each gauge location as close to the main as possible and at each location where a gauge tapping is
41 indicated.

42
43 **STRAINERS**

44 Install all strainers where indicated on the project details, allowing sufficient space for the screens to be
45 removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated
46 dirt from the strainer body.

47
48 **STEAM SYSTEMS - LOW PRESSURE (15 PSIG AND LOWER):**

49 Install a gate valve for blowdown in the tapped screen retainer; valve to be the same size as the tapping,
50 suitable for system pressure (reference section 23 05 23).

51
52 **STEAM TRAPS**

53 Where scheduled trap capacity exceeds the capacity of a single trap, contractor may, at his option, use
54 multiple traps or a single "ultra-capacity" trap.

- 1 Install on the discharge side of all steam terminals, at the end of mains, at the end of long branches, at
2 points where mains must rise to a new elevation, and elsewhere as indicated on the drawings and in the
3 manner indicated on the details. Do not lift condensate from the discharge of any trap without the written
4 permission of the Architect/Engineer.
5
6 Install a valved test tee on the discharge of all traps, as detailed. Install a strainer upstream of all drip traps
7 and all terminal equipment where a strainer is not present upstream of the control valve at the terminal.
8 Install a shutoff valve upstream of each drip trap; shutoff valves are not required when the trap is at a piece
9 of equipment which has a shutoff valve in the steam line serving it.
10
11 Install a line size dirt leg at each trap. Trap elevation to be not less than one foot below the equipment
12 outlet connection. Provide a separate trap for each equipment outlet connection.
13
14 Install a steam shutoff valve at the blowdown connection of each trap containing a strainer; terminate the
15 blowdown connection with a nipple and an end cap.
16
17 **VACUUM BREAKERS**
18 Install on steam heating coils, steam-to-water heat exchangers, and elsewhere as indicated on the drawings
19 and/or details.
20

21
22 **END OF SECTION**
23

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SECTION 23 05 23
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

SCOPE

This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- Manufacturers
- Low Pressure Steam/Condensate (15 psig or less)
 - Gate Valves
 - Globe Valves
 - Spring Loaded Check Valves
 - Drain Valves
- Specialty Valves and Valve Accessories
 - Gauge Valves
 - Stem Extensions

PART 3 - EXECUTION

- General
- Shut-off Valves
- Drain Valves
- Spring Loaded Check Valves

RELATED WORK

- Section 23 05 15 - Piping Specialties
- Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.
Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1 **DESIGN CRITERIA**

2 Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.) all valves
3 shall be of the same manufacturer unless prior written approval is obtained from A/E.

4
5 **PART 2 - PRODUCTS**

6
7 **MANUFACTURERS**

8 Anvil, Apollo, Armstrong, Bell & Gossett, Cash-Acme, Dresser Consolidated, Conval, Crane, Anderson
9 Greenwood and Crosby, Danfoss-Flomatic, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond,
10 Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer/Cincinnati, Metraflex, Milwaukee,
11 Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol,
12 Vogt, Watts, or approved equal.

13
14 **LOW PRESSURE STEAM/CONDENSATE (15 psig or less)**

15
16 **GATE VALVES:**

17 2" and smaller: Class 150, bronze body, bronze trim, threaded ends, solid wedge, rising stem, non-asbestos
18 packing, union bonnet, malleable iron hand wheel.

19
20 Crane 431UB, Hammond IB629, Milwaukee 1151(M), Nibco T134, Lunkenheimer 3151, Powell 2714,
21 Stockham B120.

22
23 2-1/2" and larger: Class 150, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel or 12% chrome
24 faced wedge, Stellite seat, flanged, bolted bonnet, non-asbestos packing.

25
26 Crane 47XU, Milwaukee 1550, Lunkenheimer 1512, Powell 1503, Stockham 1822.

27
28 **GLOBE VALVES:**

29 2" and smaller: Class 150, bronze body, bronze trim, threaded ends, teflon disc, rising stem, non-asbestos
30 packing, union bonnet, malleable iron hand wheel.

31
32 Crane 7TF, Hammond IB413T, Milwaukee 590T, Nibco T235, Lunkenheimer LQ600-150, Powell 150,
33 Stockham B-22T.

34
35 2-1/2" and larger: Class 125, iron body, bronze trim, non-asbestos packing, bolted bonnet, O.S. & Y.,
36 bronze/cast iron disc, flanged.

37
38 Crane 351, Hammond IR116, Milwaukee F2981M, Nibco F-718-B, Lunkenheimer 1123 IBBM, Powell 241,
39 Stockham G512.

40
41 **SPRING LOADED CHECK VALVES:**

42 2" and smaller: Class 125, bronze body, threaded or wafer ends, bronze trim, stainless steel spring, teflon
43 seat unless only bronze available.

44
45 APCO 300 series, ConBraCo 61 series, Mueller 303BP, Nibco T-480-Y, Val-Matic 1400 series.

46
47 2-1/2" and larger: Class 125, cast iron or semi-steel body, wafer or globe flanged type, bronze trim, bronze
48 or EPDM seat, stainless steel spring, stainless steel stem if stem is required. Valves with ductile iron in
49 contact with the working fluid will not be accepted.

50
51 APCO 600 series, Metraflex 900 series, Milwaukee 1800 series, Mueller Steam 101M-AP/105M-AP, Nibco
52 F910 series, Val-Matic 1800 series.

1 DRAIN VALVES:
2 Use 3/4 inch, class 150 gate valve as specified for steam and condensate systems with threaded hose adapter.
3 Strainer blowdown valves to be the same size at the blowdown connection. Provide hose connection caps
4 pressure rated for 150 psig at 180 deg F.

5
6 **SPECIALTY VALVES AND VALVE ACCESSORIES**

7
8 GAUGE VALVES:
9 Water Service: Use 1/4" ball valves.

10
11 Steam Service: Use 1/4" gate valves suitable for system operating pressure.

12
13 STEM EXTENSIONS:
14 Provide stem extensions when valve operators interfere with pipe insulation.

15
16 **PART 3 - EXECUTION**

17
18 **GENERAL**

19 Properly align piping before installation of valves in an upright position; operators installed below the valves
20 will not be accepted.

21
22 Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support
23 weight of piping system on valve ends.

24
25 Install all temperature control valves.

26
27 Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal
28 position only where space limitations do not allow installation in an upright position or where large valves
29 are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above
30 mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator.
31 Valves installed with the stems down, will not be accepted.

32
33 Install stem extensions when shipped loose from valve.

34
35 Prior to flushing of piping systems, place all valves in the full-open position.

36
37 **SHUT-OFF VALVES:**

38 Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for
39 isolation or repair.

40
41 **DRAIN VALVES**

42 Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of
43 piping systems, equipment locations specified or detailed including reheat coils, other locations required for
44 drainage of systems.

45
46 **SPRING LOADED CHECK VALVES**

47 Install a spring loaded check valve in each pump discharge line where two pumps operate in parallel and no
48 combination shutoff, check and balancing valve is being used.

49
50
51 **END OF SECTION**

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**SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

PART 1 - GENERAL

SCOPE

This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Reference
Reference Standards
Quality Assurance
Description
Shop Drawings
Design Criteria

PART 2 - PRODUCTS

Pipe Hanger and Support Manufacturers
Structural Supports
Pipe Hangers and Supports
Beam Clamps
Concrete Inserts
Corrosive Atmosphere Coatings

PART 3 - EXECUTION

Installation
Hanger and Support Spacing

RELATED WORK

Section 23 07 00 - HVAC Insulation

REFERENCE

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

REFERENCE STANDARDS

MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at all hanger points; see Related Work above.

1 **SHOP DRAWINGS**

2 Refer to division 1, General Conditions, Submittals.

3
4 Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for
5 each pipe size and type of service. Reference section 23 05 00.

6
7 **DESIGN CRITERIA**

8 Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice
9 SP-58 unless noted otherwise.

10
11 Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to
12 have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from
13 the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are
14 required beyond the 100 pipe diameter/3 support distance.

15
16 Piping flexible connections and vibration isolation supports are required for piping connected to coils that
17 are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation
18 supports are required for a distance of one hundred pipe diameters or three supports away from the
19 equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not
20 required when the fan section is separately and independently isolated by means of vibration supports and
21 duct flexible connections. Standard pipe hangers/supports as specified in this section are required when
22 there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.

23
24 Piping supported by laying on the bottom chord of joists or trusses will not be accepted.

25
26 Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

27
28 Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine
29 maintenance, etc.

30
31
32 **PART 2 - PRODUCTS**

33
34 **PIPE HANGER AND SUPPORT MANUFACTURERS**

35 Anvil, B-Line, G-Strut, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil
36 figure numbers are listed below; equivalent material by other manufacturers is acceptable.

37
38 **STRUCTURAL SUPPORTS**

39 Provide all supporting steel required for the installation of mechanical equipment and materials, whether or
40 not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support
41 tanks and equipment.

42
43 **PIPE HANGERS AND SUPPORTS**

44 **HANGERS FOR STEEL PIPE SIZES 1/2" THROUGH 2":**

45 Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.

46
47 **HANGERS FOR STEEL PIPE SIZES 2-1/2" AND OVER:**

48 Carbon steel, adjustable, clevis, black finish. Anvil figure 260.

49
50 Adjustable steel yoke, cast iron roll, double hanger. Anvil figure 181.

51
52 **MULTIPLE OR TRAPEZE HANGERS:**

53 Steel channels with welded spacers and hanger rods if calculations are submitted.

54
55 **WALL SUPPORT:**

56 Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.

1 Perforated epoxy painted finish, 16-12 gauge min., steel channels securely anchored to wall structure with
2 interlocking, split type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000
3 series clamps, Anvil type AS200 H with AS 1200 clamps. When copper piping is being supported,
4 provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and
5 avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers
6 clamp and cushion assemblies, B-Line BVT series, Anvil cushion clamp assembly.

7
8 **INSULATION PROTECTION SHIELDS:**

9 Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger.
10 Minimum shield length is 12 inches. Equal to Anvil figure 167.

11
12 **STEEL HANGER RODS:**

13 Threaded both ends, threaded one end, or continuous threaded, black finish.

14
15 Size rods for individual hangers and trapeze support as indicated in the following schedule.

16
17 Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed
18 the limits indicated.

19	Maximum Load (Lbs.)	Rod Diameter
20	(650°F Maximum Temp.)	(inches)
21	610	3/8
22	1130	1/2
23	1810	5/8
24	2710	3/4

25
26 Provide rods complete with adjusting and lock nuts.

27
28 **BEAM CLAMPS**

29 MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for
30 single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with
31 a hardened steel cup point set screw. Anvil figure 86.

32
33 MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable
34 for rod sizes to 1-1/2 inch diameter but limited in application to pipe sizes 8 inch and less without prior
35 approval. Anvil figure 228.

36
37 **CONCRETE INSERTS**

38 Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same
39 manufacturer as anchor. Hilti, Rawl, Redhead.

40
41 **CORROSIVE ATMOSPHERE COATINGS**

42 Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication,
43 ASTM A123, 1.5 ounces/square foot of surface, each side. Mechanical galvanize threaded products,
44 ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich
45 paint of comparable thickness to factory coating.

46
47 Corrosive atmospheres include the following locations:

- 48 • Locker/shower/toilet rooms

49
50
51 **PART 3 - EXECUTION**

52
53 **INSTALLATION**

54 Install supports to provide for free expansion of the piping and duct system. Support all piping from the
55 structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling
56 plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

1
 2 Piping shall be supported independently from ductwork and all other trades.
 3
 4 Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural
 5 shapes for the supporting steel.
 6
 7 Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of
 8 loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds
 9 after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity
 10 and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

11
 12 **HANGER AND SUPPORT SPACING**

13 Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

14
 15 Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze
 16 hangers.

17
 18 Support riser piping independently of connected horizontal piping.

19
 20 Adjust hangers to obtain the slope specified in the piping section of this specification.

21
 22 Space hangers for pipe as follows:

23

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Spacing</u>
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"

27
 28 END OF SECTION

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

SCOPE

This section includes air and water testing, adjusting and balancing for the entire project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Description
- Submittals

PART 2 - PRODUCTS

- Instrumentation

PART 3 - EXECUTION

- Preliminary Procedures
- Performing Testing, Adjusting and Balancing
- Deficiencies

RELATED WORK

- Section 23 05 00 Common Work Results for HVAC
- Section 23 07 00 HVAC Insulation
- Section 23 09 23 Direct Digital Control System for HVAC

REFERENCE

Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

REFERENCE STANDARDS

- AABC National Standards for Total System Balance, Sixth Edition, 2002.
- ASHRAE ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.
- NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.
- TABB Tab Procedural Guide, First Edition, 2003.

DESCRIPTION

The Contractor will separately contract with an independent test and balance agency to perform all testing, adjusting, and balancing of air and hydronic systems required for this project. Work related to the testing, adjusting, and balancing that must be performed by the installing mechanical contractor is specified in other section of these specifications.

Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings, electrical measurement and verification of performance of all mechanical equipment, all in accordance with standards published by AABC, NEBB, or TABB.

Test, adjust and balance all air and hydronic systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.

1 Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of
2 major buildings, occupancy of one building when the project involves many buildings, and completion of
3 the entire project in the time stated in the Instruction to Bidders and in accordance with the completion
4 schedule established for this project.

5
6 Verify that provisions are being made to accomplish the specified testing, adjusting and balancing work. If
7 problems are found, handle as specified in Part 3 under Deficiencies.

8 9 **QUALITY ASSURANCE**

10 11 **Qualifications**

12 An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of 3
13 years. A Firm not engaged in the commerce of furnishing or providing equipment or material generally
14 related to HVAC work other than that specifically related to installing Testing and Balancing components
15 necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.

16
17 A certified member of AABC or certified by NEBB or TABB in the specific area of work performed.
18 Maintain certification for the entire duration of the project. If certification of firm or any staff performing
19 work is terminated or expires during the duration of the project, contact the A/E immediately.

20
21 Technicians on this project must have satisfactorily completed work on a minimum of (3) three projects of
22 at least 50% in size, and of similar complexity. Size is defined as the quantity of each specific individual
23 item requiring testing and balancing such as, but not limited to, equipment, devices, terminal devices, and
24 grilles and diffusers.

25 26 **SUBMITTALS**

27 See also Related Work in this section.

28
29 Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB, AABC or
30 TABB Certified Test and Balance Supervisor. The reports certify that the systems have been tested,
31 adjusted and balanced in accordance with the referenced standards; are an accurate representation of how
32 the systems have been installed and are operating; and are an accurate record of all final quantities
33 measured to establish normal operating values of the systems.

34
35 Format: Cover page identifying project name, project number and descriptive title of contents. Divide the
36 contents of the report into the below listed divisions:

- 37 • General Information
- 38 • Summary
- 39 • Air Systems

40
41 Contents: Provide the following minimum information, forms and data:

42
43 General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect,
44 Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers.
45 Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.

46
47 Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable
48 noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting
49 unsatisfactory performances and indicate whether modifications required are within the scope of the
50 contract, are design related or installation related. List instrumentation used during testing, adjusting and
51 balancing procedures.

52
53 The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each
54 respective item and system. Fill out forms completely. Where information cannot be obtained or is not
55 applicable indicate same.

1 **PART 2 - PRODUCTS**

2
3 **INSTRUMENTATION**

4 Provide all required instrumentation to obtain proper measurements. Application of instruments and
5 accuracy of instruments and measurements to be in accordance with the requirements of NEBB, AABC, or
6 TABB Standards and instrument manufacturer's specifications.

7
8 All instruments used for measurements shall be accurate, and calibration histories for each instrument to be
9 available for examination by DD upon request. Calibration and maintenance of all instruments to be in
10 accordance with the requirements of NEBB, AABC, or TABB Standards

11 **PART 3 - EXECUTION**

12
13
14 **PRELIMINARY PROCEDURES**

15 Review preconstruction meeting report, applicable construction bulletins, applicable change orders and
16 approved shop drawings of equipment, outlets/inlets and temperature controls.

17
18 Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and
19 belt tension, temperature controls for completion of installation and hydronic systems for proper charge and
20 purging of air.

21
22 Identify deficiencies preventing completion of testing, adjusting and balancing procedures. Do not proceed
23 until systems are fully operational with all components necessary for complete testing, adjusting and
24 balancing. Installing Contractors are required to provide personnel to check and verify system completion,
25 readiness for balancing and assist Balancing Agency in providing specified system performance.

26
27 **PERFORMING TESTING, ADJUSTING AND BALANCING**

28 Perform testing, adjusting and balancing procedures on each system identified, in accordance with the
29 detailed procedures outlined in the referenced standards except as may be modified below.

30
31 Unless specifically instructed in writing, all work in this specification section is to be performed during the
32 normal workday.

33
34 In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is
35 complete and provide new tile for any tile that are damaged by this procedure. If the ceiling construction is
36 such that access panels are required for the work of this section and the panels have not been provided,
37 inform the owner's project representative.

38
39 Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for
40 adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor
41 barrier integrity and pressure rating of systems.

42
43 In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway
44 between that of a clean filter and that of a dirty filter.

45
46 Measure and record system measurements at the fan and/or pump to determine total flow. Adjust
47 equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and
48 branches as required for final terminal balancing. Perform terminal balancing to specified flows balancing
49 branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

50
51 Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling
52 coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty
53 filter. Spot check static air pressure conditions directly ahead of terminal units.

54
55 Adjust outside air, return air and relief air dampers for design conditions at both the minimum and
56 maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and

1 record both sets of data. Balance variable air volume systems at maximum air flow rate, full cooling, and
2 minimum flow rate, full heating; record all data.

3
4 Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and
5 uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed
6 system.

7
8 Provide fan and motor drive sheave adjustments necessary to obtain design performance. Provide drive
9 changes specifically noted on drawings, if any. If work of this section indicates that any drive or motor is
10 inadequate for the application, advise the owner's project representative by giving the representative
11 properly sized motor/drive information (in accordance with manufacturers original service factor and
12 installed motor horsepower requirements); Confirm any change will keep the duct/piping system within its
13 design limitations with respect to speed of the device and pressure classification of the distribution system.
14 Required motor/drive changes not specifically noted on drawings or in specifications will be considered an
15 extra cost and will require an itemized cost breakdown submitted to owner's project representative. Prior
16 authorization is needed before this work is started.

17
18 Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent
19 spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution
20 dampers, terminals and controls to maintain indicated pressure relationship.

21
22 Final air system measurements to be within the following range of specified cfm:

23 Fans	0% to +10%
24 Supply grilles, registers, diffusers	0% to +10%
25 Return/exhaust grilles, registers	0% to -10%

26
27 Contact the temperature control Contractor for assistance in operation and adjustment of controls during
28 testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints.
29 Include in report description of temperature control operation and any deficiencies found.

30
31 Permanently mark equipment settings, including damper and valve positions, control settings, and similar
32 devices allowing settings to be restored. Set and lock memory stops.

33
34 Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes,
35 and restoring temperature controls to normal operating settings.

36 **DEFICIENCIES**

37 Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency
38 that were specified and/or shown on the Contract Documents to be performed as part of that division of
39 work. Test and balance agency will notify the A/E of these items and instructions will be issued to the
40 Division 23 00 00 contractor for correction of the deficient work. All corrective work to be done at no cost
41 to the Owner. Retest mechanical systems, equipment, and devices once corrective work is complete as
42 specified.

43
44
45
46 **END OF SECTION**
47
48

1	ASTM C302	Density of Preformed Pipe Insulation
2	ASTM C272	Water Absorption of Core Materials for Sandwich Constructions
3	ASTM C303	Density of Preformed Block Insulation
4	ASTM C355	Test Methods for Test for Water Vapor Transmission of Thick Materials
5	ASTM C449	Mineral Fiber Hydraulic Setting Thermal Insulation Cement
6	ASTM C518	Heat Flux and Thermal Transmission Properties
7	ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation
8	ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
9	ASTM C547	Mineral Fiber Preformed Pipe Insulation
10	ASTM C552	Cellular Glass Block and Pipe Thermal Insulation
11	ASTM C553	Mineral Fiber Blanket and Felt Insulation
12	ASTM C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
13	ASTM C591	Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
14	ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation
15	ASTM C612	Mineral Fiber Block and Board Thermal Insulation
16	ASTM C921	Properties of Jacketing Materials for Thermal Insulation
17	ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
18	ASTM C1728	Standard for Aerogel Insulation
19	ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
20	ASTM D1000	Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
21		
22	ASTM D1621	Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
23	ASTM D1622	Standard Test Method for Apparent Density of Rigid Cellular Plastics
24	ASTM D1940	Method of Test for Porosity of Rigid Cellular Plastics
25	ASTM D2126	Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
26	ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
27	ASTM D5590	Test Method for Determining the Resistance of Coatings to Fungal Defacement
28	ASTM E84	Surface Burning Characteristics of Building Materials
29	ASTM E814	Standard Test Method for Fire Tests of Penetration Firestop Systems
30	ASTM E2336	Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
31	MICA	National Commercial & Industrial Insulation Standards
32	NFPA 225	Surface Burning Characteristics of Building Materials
33	UL 723	Surface Burning Characteristics of Building Materials
34		

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

Insulation systems shall be applied by experienced contractors. Within the past five (5) years, the contractor shall be able to document the successful completion of a minimum of three (3) projects of at least 50% of the size and similar scope of the work specified in this section.

DESCRIPTION

Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:

- Pipe Insulation
- Duct Insulation

Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the A/E.

1 **DEFINITIONS**

2 Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other
3 areas, including walk-through tunnels, shall be considered as exposed.

4
5 **SHOP DRAWINGS**

6 Refer to division 1, General Conditions, Submittals.

7
8 Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening
9 methods, fitting materials along with material safety data sheets and intended use of each material. Include
10 manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and
11 manufacturer's installation instructions. Include copies of the MICA plates that are applicable to this project.

12
13 **OPERATION AND MAINTENANCE DATA**

14 All operations and maintenance data shall comply with the submission and content requirements specified
15 under section GENERAL REQUIREMENTS.

16
17 **ENVIRONMENTAL REQUIREMENTS**

18 Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install insulation
19 products that have been exposed to water.

20
21 Protect installed insulation work with plastic sheeting to prevent water damage.

22
23
24 **PART 2 - PRODUCTS**

25
26 **MATERIALS**

27 Manufacturers: Armacell, CertainTeed, Manson, Childers, Dow, Extol, Fibrex, Halstead, Foster, Imcoa,
28 ITW, Johns Manville, Knauf Insulation, Owens-Corning, Pittsburgh Corning, VentureTape or approved
29 equal.

30
31 Materials or accessories containing asbestos will not be accepted.

32
33 Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame
34 spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

35
36 Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke
37 developed rating no higher than 450 when tested in accordance with UL 723 and ASTM E84.

38
39 **INSULATION TYPES**

40 Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall
41 be suitable to receive jackets, adhesives and coatings as indicated.

42
43 **FLEXIBLE FIBERGLASS INSULATION:**

44 Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.30 at 75
45 degrees F mean temperature, rated for maximum service temperature of 250 degrees F.

46
47 **RIGID FIBERGLASS INSULATION:**

48 Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees
49 F mean temperature, 0.25 at 125 degrees F, 0.27 at 150 degrees F, 0.29 at 200 degrees F, 0.32 at 250 degrees
50 F, minimum compressive strength of 25 PSF at 10% deformation, rated for maximum service temperature of
51 450 degrees F.

52
53 **SEMI-RIGID FIBERGLASS INSULATION:**

54 Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F
55 mean temperature, minimum compressive strength of 25 PSF at 10% deformation, rated for service

1 temperature range of 0 degrees F to 450 degrees F. Insulation fibers perpendicular to jacket and scored for
2 wrapping cylindrical surfaces.

3 4 **ELASTOMERIC INSULATION:**

5 Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than
6 0.28 at 75 degrees F mean temperature, minimum compressive strength of 4.5 psi at 25% deformation,
7 maximum water vapor permeability of 0.08 perm inch, maximum water absorption of 6% by weight, rated
8 for service temperature range of -20 degrees F to 220 degrees F on piping and 180 degrees F where adhered
9 to equipment.

10 11 **ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS**

12 Products shall be compatible with surfaces and materials on which they are applied and shall be suitable for
13 use at operating temperatures of systems to which they are applied.

14 15 **FIBERGLASS INSULATION ADHESIVE:**

16 Must comply with ASTM C916, Type II: Foster 85-60, Childers CP-127, Duro Dyne SSG.

17 18 **INSULATION JOINT SEALANT:**

19 Joint sealants to be non-shrinking and permanently flexible.

20 Used on all below ambient piping to prevent moisture ingress.

21 For Cellular Glass, Polyisocyanurate, Phenolic use Foster 95-44 Elastolar, Childers CP-76 Chil-Byl,
22 Pittsburgh Corning CW Sealant.

23 For Polystyrene use Foster 30-45N, Childers CP-70.

24 For Elastomeric use Armaflex 520 or equal.

25 26 **JACKETS**

27 **PVC FITTING COVERS AND JACKETS (PFJ):**

28 White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade
29 GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet
30 radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be minimum .02"
31 indoors/.03"outdoors for piping 12" and smaller, .03" indoors/.04" outdoors for piping 15" and larger.

32 33 **ALL SERVICE JACKETS (ASJ):**

34 Heavy duty, fire retardant material with polymer coated white kraft reinforced foil vapor retarder jacket,
35 factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02
36 perms and minimum beach puncture resistance of 50 units.

37 38 **FOIL SCRIM KRAFT ALL SERVICE JACKETS (FSK):**

39 Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms
40 and minimum beach puncture resistance of 25 units.

41 42 **WHITE METALIZED POLYPROPYLENE SCRIM KRAFT ALL SERVICE JACKETS (PSK):**

43 Glass fiber reinforced white metalized polypropylene, factory applied to insulation. Maximum permeance of
44 .02 perms and minimum beach puncture resistance of 25 units.

45 46 **INSULATION INSERTS AND PIPE SHIELDS**

47 Manufacturers: B-Line, Pipe Shields, Value Engineered Products.

48
49 Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300 degrees F only),
50 minimum 140 psi compressive strength. Piping 12" and larger, supplement with high density 600 psi
51 structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree
52 coverage on bottom supported piping and full 360 degree coverage on clamped piping. On roller mounted
53 piping and piping designed to slide on support, provide additional load distribution steel plate.

54
55 Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses,
56 gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered/premanufactured product

1 described above. On low temperature systems, high density rigid polyisocyanurate may be substituted for
2 calcium silicate provided insert and shield length and shield gauge are increased to compensate for lower
3 insulation compressive strength.

4
5 Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent
6 insulation may be substituted for calcium silicate inserts with one 1"x6" block for piping through 2-1/2" and
7 three 1"x6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-
8 engineered/premanufactured product described above.

9
10 Wood blocks will not be accepted.

11 **ACCESSORIES**

12 All products shall be compatible with surfaces and materials on which they are applied and be suitable for
13 use at operating temperatures of the systems to which they are applied.

14
15 Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for
16 applications specified.

17
18 Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be
19 0.015 inch for aluminum and 0.010 inch for stainless steel.

20
21 Tack fasteners to be stainless steel ring grooved shank tacks.

22
23 Staples to be clinch style.

24
25 Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

26
27 Finishing cement to be ASTM C449.

28
29 Fibrous glass or canvas fabric reinforcing used with lagging adhesive shall have a minimum untreated weight
30 of 6 oz./sq. yd.

31
32 Fungicidal water base duct liner coating (Foster 40-20 or equal) to be compatible with vapor retarding
33 coating. This product must be EPA registered to be used inside HVAC ducts. Coating must comply with
34 ASTM D 5590 with 0 growth rating.

35 **PART 3 - EXECUTION**

36 **EXAMINATION**

37 Verify that all piping, equipment, and ductwork are tested and approved prior to installing insulation. Do not
38 insulate systems until testing and inspection procedures are completed.

39
40 Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

41 **INSTALLATION**

42 All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be
43 installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.
44 Do not install products when the ambient temperature or conditions are not consistent with the manufacturer's
45 recommendations. Surfaces to be insulated must be clean and dry.

46
47 Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such
48 a manner as to protect all raw edges, ends and surfaces of insulation.

49
50 Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be
51 accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other
52 locations where insulation terminates.

1
2 Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
3

4 Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or
5 pieces cut undersize and stretched to fit will not be accepted.
6

7 All pipe and duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves
8 except where firestop or firesafing materials are required. Vapor retarding jacket shall be maintained
9 continuous through all penetrations.

10
11 Provide a continuous unbroken moisture vapor retarding jacket on insulation applied to systems noted below.
12 Attachments to cold surfaces shall be insulated and vapor sealed to prevent condensation.
13

14 Provide a complete vapor retarding jacket for insulation on the following systems:

- 15 • Refrigerant
 - 16 • Insulated Duct
 - 17 • Equipment, ductwork or piping with a surface temperature below 65 degrees F
- 18

19 **PROTECTIVE JACKET INSTALLATION**

20

21 **PVC FITTING COVERS AND JACKETS (PFJ):**

22 Lap seams and joints a minimum of 2 inches and continuously seal PVC with welding solvent recommended
23 by jacket manufacturer. Secure PVC fittings with welding solvent on seams and joints. Lap slip joint ends 4"
24 without fasteners where required to absorb expansion and contraction. For sections where vapor retarding
25 jacket is not required, and jacket requires routine removal, tack fasteners may be used. For systems requiring
26 a vapor retarding jacket, apply a 1-1/2" band of mastic over ends, throat, seams and penetrations.
27

28 **ALL SERVICE JACKETS (ASJ) and FOIL SCRIM KRAFT JACKETS (FSK):**

29 Install according to manufacturer's recommendations using factory supplied lap seals and butt strip seals. In
30 addition to factory adhesive, secure lap seals and tape with clinch type staples.
31

32 **PIPING, VALVE, AND FITTING INSULATION**

33 **GENERAL:**

34 Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket
35 seams and 3" tape on butt joints, firmly cemented with lap adhesive unless otherwise noted. Additionally,
36 secure with clinch style staples along seams and butt joints.
37

38 On systems requiring a vapor retarding jacket, seal off all raw ends of insulation and butt joints with vapor
39 retarding mastic at intervals of not more than 20 feet on piping to create a vapor dam. Also provide a vapor
40 dam on each side of valves, unions, and tees. Coat staples, longitudinal and transverse seams with vapor
41 retarding mastic and on systems requiring vapor retarding jacket, coat insulated elbows, fittings, and valves
42 with vapor retarding mastic.
43

44 Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of
45 insulation. Where a vapor retarding jacket is not required or where roller hangers are not being used, hangers
46 and supports may be attached directly to piping with insulation completely covering hanger or support and
47 jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping
48 requiring vapor retarding jacket, extend insulation and vapor retarding jacketing/coating around riser clamp.
49

50 Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous
51 through the hangers and supports. High density inserts shall be provided as required to prevent the weight of
52 the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall
53 not be notched or cut to accommodate the supporting channels.
54

1 **INSULATION INSERTS AND PIPE SHIELDS:**
 2 Provide pipe shields at all hanger and support locations. Rigid insulation inserts shall be installed between
 3 the pipe and the insulation shields. Quantity and placement of inserts shall be according to the manufacturer's
 4 installation instructions; however, the inserts shall be no less than 12" in length. Inserts shall be of equal
 5 thickness to the adjacent insulation and shall be vapor sealed as required for system.

6 Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on
 7 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.
 8

9 **FITTINGS AND VALVES:**
 10 Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up
 11 insulation of the same thickness as adjoining insulation. Where the ambient temperature exceeds 150 degrees
 12 F, cover insulation with fabric reinforcing and mastic. Where the ambient temperatures do not exceed 150
 13 degrees, furnish and install PVC fitting covers.
 14

15 **ELASTOMERIC AND POLYOLEFIN:**
 16 Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings
 17 allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation.
 18 For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyolefin, seal factory preglued
 19 seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces. Cover
 20 elastomeric insulation on systems operating below 40 degrees F with vapor retarding mastic.
 21

22 **PIPING PROTECTIVE JACKETS**
 23 In addition to the jackets specified in the pipe insulation schedule below the following protective jackets are
 24 required:
 25

- 26 Provide a protective PVC jacket (PFJ) for the following insulated piping:
- 27 • All steam and condensate piping and fittings exposed in the following locations: Exposed
 28 within Team Rooms.
 - 29 • Refrigerant piping and fittings exposed in the following locations: Exposed within Team
 30 Rooms, Mechanical, Storage and Catering).
 - 31 • Cooling coil condensate exposed in the following locations: Exposed within Team Rooms,
 32 Mechanical, Storage and Catering.
 33

34 **PIPE INSULATION SCHEDULE:**
 35 Provide insulation on new and existing remodeled piping system as indicated in the following schedule:
 36

SERVICE	INSULATION	JACKET	INSULATION THICKNESS BY PIPE SIZE				
			< 1"	1" to < 1-1/2"	1-1/2" to < 4"	4" to < 8"	8" and Larger
Refrigeration Suction							
> 40°F	Elastomeric	None	1.5"	1.5"	1.5"	1.5"	1.5"
40°F to 20°F	Elastomeric	None	1.5"	1.5"	1.5"	1.5"	1.5"
Cooling Coil Condensate Drain	Rigid Fiberglass	ASJ	0.5"	0.5"	1"	1"	1"
Low Pressure Steam	Rigid Fiberglass	ASJ	2.5"	2.5"	2.5"	3"	3"
Low Pressure Cond.	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"	2"

- 37
 38 The following piping and fittings are not to be insulated:
 39 • Steam Traps
 40 • Piping unions for systems not requiring a vapor retarding Jacket
 41

1 For systems with fluid temperatures 65° F or less, furnish and install removable elastomeric insulation covers,
 2 plugs or caps for all mechanical equipment and devices that require access by balancing contractors or service
 3 and maintenance personnel. Examples include but are not limited to: flow sensing devices, circuit setters,
 4 manual ball valve air vents, drain valves, blowdown valves, pressure/temperature test plugs, grease fittings,
 5 pump bearing caps, equipment labels, etc. Covers shall be tight fitting to ensure a complete vapor retarding
 6 barrier.

7
 8 **DUCT INSULATION**

9 **GENERAL:**

10 Secure flexible blanket duct insulation on sides and bottom of ductwork over 24" wide with weld pins. Space
 11 fasteners 18" on center or less as required to prevent sagging. Compress insulation no more than 25%.

12
 13 Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted together
 14 and placed as close as possible to the equipment surface. Pins shall be located a maximum of 3" from each
 15 edge and spaced no greater than 12" on center.

16
 17 Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and
 18 cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4" tape
 19 of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges
 20 and penetrations to be fully vapor sealed with vapor retarding mastic.

21
 22 Stop and point insulation around access doors and damper operators to allow operation without disturbing
 23 insulation or jacket material.

24
 25 External supply duct insulation is not required where ductwork contains continuous 1" acoustical liner.
 26 Provide 4" overlap of external insulation over ends of acoustically lined sections.

27
 28 Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous
 29 through the hangers. Drop the supporting channels required to facilitate the installation of the insulation.
 30 Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the
 31 ductwork from crushing the insulation.

32
 33 Where insulated duct risers are supported by steel channels secured directly to the duct, extend the insulation
 34 and vapor retarding jacketing to encapsulate the support channels.

35
 36 **DUCT INSULATION SCHEDULE:**

37 Provide duct insulation on new and existing remodeled ductwork in the following schedule:
 38

SERVICE	INSULATION TYPE	JACKET	THICKNESS
Exposed supply ducts (Team Rooms Only)	Rigid Fiberglass	FSK	2"
	Flexible Fiberglass	PSK	2"
Concealed supply ducts	Flexible Fiberglass	FSK	2.25"
Exhaust and relief ducts downstream of motorized backdraft dampers	Rigid Fiberglass	FSK	2"

39
 40 * Exposed supply main ducts running through spaces they serve shall be insulated as exposed
 41 supply ducts scheduled above.

42
 43 **END OF SECTION**

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SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

SCOPE

The existing building utilizes a Johnson Controls Metasys based direct digital control (DDC) system. This project will add new split-system ducted air-conditioning units and roof mounted exhaust fans with DDC control that will be integrated into the existing building Johnson Controls Metasys based DDC system. This project shall provide:

- All new controllers required to integrate (4) new split-system ducted air-conditioning units and exhaust fans into the existing building automation system.
- New control dampers at exhaust fans with fan interlock control with existing operating system.
- All control wiring (low and line voltage) for a complete operating system.
- Update of existing building automation graphics to include new split-system ducted air-conditioning units, exhaust fans, etc. associated with this project.
- Tie in of all new controllers to the existing Metasys controller.

All new split-system ducted air-conditioners shall be integrated into the Metasys based DDC system.

All new controllers, control wiring and temperature control valves shall follow current Coliseum Facilities protocols to provide building continuity regarding controllers, wiring and equipment.

Work in this section includes Direct Digital Control (DDC) panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete Direct Digital Control (DDC) system. This system is utilizing Direct Digital Control signals to operate actuated control devices will meet, in every respect, all operational and quality standards specified herein.

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Work Not Included
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Material Delivery and Storage

PART 2 - PRODUCTS

- General
- Local Control Panels
- Direct Digital Controls (DDC)
- Networking/Communications
- BACnet Requirements
- Supervisory Controllers
- Software License Agreement
- System Software Features
- Programmable Controllers
- Application Specific Controllers - HVAC
- Operator Interface Requirements

PART 3 - EXECUTION

- General
- Installation

1 Owner Training
2 Commissioning, Verification and Closeout
3 Sequence of Operation
4

5 **RELATED WORK**

6 Applicable provisions of Division 1 govern work under this Section.

7
8 Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination
9

10 Division 23 - HVAC - Equipment provided to be controlled or monitored
11 Division 26 - Electrical - Equipment provided to be controlled or monitored
12

13 **REFERENCE**

14 Applicable provisions of Division 1 govern work under this section.
15

16 **REFERENCE STANDARDS**

17 FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio Communication Interference
18

19 **WORK INCLUDED**

20 This section work includes furnishing and installing all field devices, including electronic sensors for the
21 DDC of this section, equipment, and all related field wiring, interlocking control wiring between equipment,
22 pneumatic tubing, sensor mounting, etc.
23

24 Motorized control dampers and actuators, thermowells (temperature sensing wells), automatic control valves
25 and their actuators are also covered in this section of work.
26

27 **QUALITY ASSURANCE**
28

29 MANUFACTURER:

30 Johnson Controls Metasys controllers and field devices to be integrated into the existing Metasys based
31 building automation system / front end. No other manufacturers will be considered.
32

33 INSTALLER:

34 The installer shall be specialized and experienced in Johnson Controls Metasys DDC control systems and
35 installation for no less than 3 years. All engineering work shall be done by qualified employees of Johnson
36 Controls, or qualified employees of a Johnson Controls Metasys Authorized Representative that provides
37 engineering and commissioning of Johnson Controls control equipment. Where installing contractor is an
38 authorized representative of Johnson Controls, submit written confirmation of such authorization. Indicate in
39 letter of authorization that the installing contractor has successfully completed all necessary training required
40 for the engineering, installation, and commissioning of equipment and systems to be provided for the project
41 and that such authorization has been in effect for a period of not less than three years. The letter of
42 authorization should also indicate that the installing contractor is authorized to install Johnson Controls DDC
43 equipment at the project location at the time the project is bid. Installation of the equipment shall be done by
44 qualified mechanics and/or electricians in the direct employ or be directly subcontracted and under the
45 supervision of Johnson Controls or Authorized Johnson Controls Representative.
46

47 **RESPONSE TIME:**

48 During warrantee period, four (4) hours or less, 24-hours/day, 7 days/week.
49

50 ELECTRICAL STANDARDS:

51 Provide electrical products, which have been tested, listed and labeled by Underwriters' Laboratories (UL)
52 and comply with NEMA standards.
53

54 DDC Standards: DDC manufacturer shall provide written proof with shop drawings that the equipment being
55 provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic
56 Equipment to Radio Communications (Part 15, Subpart J, Class A).

1 **SUBMITTALS**

2 Include the following information:

3
4 Details of construction, layout, and location of each temperature control panel within the building, including
5 instruments location in panel and labelling. Indicate which piece of mechanical equipment is associated with
6 each controller and what area within the building is being served by that equipment. For terminal unit control,
7 provide a room schedule that would list mechanical equipment tag, room number of space served, address of
8 DDC controller, and any other pertinent information required for service.
9

10 PRODUCT DATA

11 Submit manufacturer's specifications for each control device furnished, including installation instructions
12 and start-up instructions. General catalog sheets showing a series of the same device is not acceptable unless
13 the specific model is clearly marked. Annotated software program documentation shall be submitted for
14 system sequences, along with descriptive narratives of the sequence of operation of the entire system
15 involved. Submit wiring diagram for each electrical control device along with other details required to
16 demonstrate that the system has been coordinated and will function as a system.
17

18 MAINTENANCE DATA

19 Submit maintenance data and spare parts lists for each control device. Include this data in maintenance
20 manual.
21

22 RECORD DRAWINGS

23 Prior to request for final payment provide complete composite record drawings to incorporate the DDC and
24 Pneumatic/Electric field work. All software addressing for device communication shall be noted for all
25 devices provided under this section and the communication addressing required for devices provided by
26 others that are integrated into the direct digital control system provided under this section. Point to point
27 routing of communication trunks and power wiring between DDC controllers, DDC communication devices,
28 control panels, and Ethernet switches shall be documented. For systems that have additions to existing
29 communication networks, provide complete DDC network diagrams for the entire building with new work
30 clearly delineated. Coordinate with the supplier of the equipment specified to be interfaced through digital
31 communications for communication addressing. Provide circuit number of 120VAC panel power circuit(s)
32 feeding each control panel on record drawings. Label circuit number(s) inside the panel served.
33

34 **OPERATION AND MAINTENANCE DATA**

35 All operations and maintenance data shall comply with the submission and content requirements specified
36 under section GENERAL REQUIREMENTS.
37

38 **MATERIAL DELIVERY AND STORAGE**

39 Provide factory shipping cartons for each piece of equipment and control device. This contractor is
40 responsible for storage of equipment and materials inside and protected from the weather.
41
42

43 **PART 2 - PRODUCTS**

44
45 **GENERAL**

46 Provide DDC control products in sizes and of capacities as required, conforming to manufacturer's standard
47 materials and components as published in their product information, designed and constructed as
48 recommended by the manufacturer and as required for application indicate.
49

50 System shall be capable of operating with 120 VAC power supply, fully protected with a shutdown-restart
51 circuit, and associated hardware and software.
52

53 All DDC controllers shall use screw terminals for termination of individual wires. Spade lugs are not
54 acceptable.
55
56

1 **DIRECT DIGITAL CONTROLS**

2 Provide extension of existing direct digital building automation system to the area of renovation. System to
3 be capable of integrating multiple building functions, including equipment supervision and control, alarm
4 management, energy management, and trend data collection.

5
6 DDC to consist of Supervisory Controllers, Programmable Controllers, stand-alone Application Specific
7 Controllers (ASC's), Operators Terminals, Operator Workstations, DDC system servers, and other operator
8 interface devices.

9
10 The vendor of the system provided under this Section shall provide all software and communication interface
11 hardware necessary to program and upload/download programmable and application specific controllers
12 from a laptop computer and make additional copies and future software revisions available for sale directly
13 to the user Agency.

14
15 The system shall be modular in nature, and shall permit expansion of both capacity and functionality through
16 the addition of sensors, actuators, ASC's, and operator devices.

17
18 The failure of any single component or network connection shall not interrupt the execution of control
19 strategies at other operational devices.

20
21 **LOCAL CONTROL PANELS**

22 Use existing local control panels if adequately sized. If not, provide new/adjacent local control panel. Use
23 control panels with suitable mounting brackets for each supply fan system. Locate panel adjacent to system
24 served.

25
26 Fabricate panels of 14 gauge furniture grade steel or 6063-T5 extruded aluminum alloy, totally enclosed on
27 six sides, hinged door and keyed lock, with manufacturer's standard shop painted finish and color.

28
29 Provide UL listed cabinets for use with line voltage devices.

30
31 Control panels that have devices or terminations that are fed or switch 50V or higher shall enclose the devices,
32 terminations, and wiring so that Personal Protective Equipment (PPE) is not required to service the under
33 50V devices and terminations within the control panel. As an alternative, a separate panel for only the 50V
34 and higher devices may be provided and mounted adjacent to the under 50V control panel. For DDC
35 controllers that are directly fed by 120VAC, provide an externally mounted 120VAC, 5A fast blow fuse to
36 feed these controllers.

37
38 Plastic control enclosures will be approved provided all conduits are bonded and grounded.

39
40 Provide control panels for all DDC Controllers, ASC's and associated function modules.

41
42 All controls to be in control panels provided under this Section except for the following:

- 43 • Above accessible lay-in tile ceilings where additional controllers are required for split-system
44 air conditioner unit control. Where additional controllers are required, they shall not be
45 mounted directly to the ductwork but be mounted on din rail or back panel in an accessible
46 location as close as possible to the unit(s) being controlled.
- 47 • Any devices other than DDC controllers, i.e. relays, pressure switches, etc. shall be installed in
48 an enclosure.

49
50 Provide unit equipment enclosures with removable cover for all terminal units located in exposed ceilings or
51 in mechanical rooms that completely enclose the DDC controller and allow for conduit terminations.

52
53 All wiring for controllers shall be managed in a neat and workmanlike manner.

54
55 Permanently label all controls; tag all control wiring, and document both on control drawings.

1 **NETWORKING/COMMUNICATIONS**

2 The design of the DDC shall be networked. The highest level networking shall use Ethernet and the sub-
3 level networking shall use serial communications. Inherent in the system's design shall be the ability to
4 expand or modify the highest network either via a local area network (LAN), wide area network (WAN), or
5 a combination of the two schemes.

6
7 The highest-level DDC communications network shall be capable of direct connection to and communication
8 with a high-speed LAN or WAN utilizing an Ethernet connection.

9
10 The supervisory controller shall directly oversee a local network such that communications may be executed
11 directly to and between programmable controllers and ASC's. All operator devices, either network resident
12 or connected via dial-up modems, shall have the ability to access all points and application reports on the
13 network.

14
15 Provide serial communication ports on all ASC's for operator's terminal communications with the DDC
16 Controller.

17
18 Access to system data shall not be restricted by the hardware configuration of the DDC system.

19
20 Global data sharing or global point broadcasting shall allow point data to be shared between programmable
21 controllers and ASC's when it would be impractical to locate multiple sensors.

22
23 **BACNET REQUIREMENTS**

24 BACnet of highest level network communications shall be capable of BACnet/IP over Ethernet and field
25 level communications shall utilize BACnet MSTP.

26
27 All controllers shall provide a Protocol Implementation Conformance Statement (PICS) and BACnet
28 Interoperability Building Blocks (BIBB'S) as required by the American National Standards
29 Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE)
30 Standard 135-2001, BACnet protocol.

31
32 In general, all devices shall support the following:

33
34 Segmentation Capability
35 Segmentation requests supported
36 Segmentation responses supported

37
38 Standard Object Types Supported

- 39 • Analog input
- 40 • Analog output
- 41 • Analog value
- 42 • Binary input
- 43 • Binary output
- 44 • Binary value
- 45 • Calendar
- 46 • Device
- 47 • Event enrollment
- 48 • Group
- 49 • Multistate input
- 50 • Multistate output
- 51 • Multistate value
- 52 • Notification class
- 53 • Schedule

1 Character Sets supported

- 2 • ANSI X3.4
- 3 • ISO 10646 Universal Character Set-2

4
5 All highest level networked supervisory devices shall support the following:

6
7 Data Link Layer Option

- 8 • BACnet Internet Protocol (IP) (Annex J)

9
10 Networking Options

11
12 BACnet/IP Broadcast Management Device (BBDM)

13
14 BACnet object name and description shall match the existing naming conventions used by the existing
15 facilities for their existing Building Automation System. Coordinate with the existing facilities control
16 personnel to establish the naming conventions prior to programming of any controllers provided under this
17 specification section. All controllers shall have object names, descriptions, and engineering units that are
18 writable at the controller level and shall be programmed so that the object names, descriptions, and
19 engineering units match the desired naming standards as specified above. Ensure that the BACnet object
20 attributes for object name, object description, engineering units and other required attributes will be
21 transferred through to the Supervisory Controller when the auto-discovery function is executed.

22
23 Coordinate BACnet device instance numbering with the facilities personnel for controllers provided under
24 this Section that are being connected to an existing building automation system. This contractor shall be
25 responsible for correcting any conflicts with existing devices that may occur or changing the device instance
26 numbers to comply to follow the agency BACnet device instance numbering scheme.

27 28 **SUPERVISORY CONTROLLERS**

29 The existing controller located in the Coliseum Building shall be used as the supervisory controller for this
30 project.

31 32 **OPERATOR INTERFACE REQUIREMENTS**

33 The existing web-based browser interface and graphic-based display shall be used, expanded and modified
34 to reflect the new floor plan and direct digital control modifications and expansions as required as part of this
35 project.

36
37 Update all graphics to reflect the new floor plan and new equipment integrated into the DDC system.

38 39 40 **PART 3 - EXECUTION**

41 42 **GENERAL**

43 All electronic work required as an integral part of the Direct Digital Control system work is the responsibility
44 of this section unless specifically indicated otherwise in this section, or in Division 26.

45
46 This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and
47 certificates required to install a complete Direct Digital Control system as herein specified.

48
49 Any and all points added with this project shall be grouped for display purposes into the system such that all
50 points associated with a new or existing DDC system can appear together on the flat panel display or printed
51 log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct
52 digital control. It shall be possible to assign a point to appear in more than one system. An English descriptor
53 and an alpha/numeric identifier shall identify each system.

54
55 This Direct Digital Control system as herein specified shall be fully integrated and completely installed by
56 this section. It shall include all required computer CPU software and hardware. Include the engineering,

1 installation, supervision, calibration, software programming, and checkout necessary for a fully operational
2 system.

3 4 **INSTALLATION**

5 All work and materials are to conform in every detail to the rules and requirements of the National Electrical
6 Code and present manufacturing standards. All wiring and cable installation shall conform with the wiring
7 installation as specified in the installation section of Section 23 09 14. All material shall be UL approved.

8
9 Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details
10 on drawings.

11
12 Line voltage wiring to power the DDC Controllers, not provided by the Division 26 contractor, to be by this
13 contractor.

14
15 Control panels serving equipment fed by emergency power shall also be served by emergency power.

16
17 Provide uninterruptable power supplies where necessary to provide proper start-up of equipment or to
18 accomplish power restart control sequences specified.

19
20 Label all control devices with the exception of dampers, valves, and terminal unit devices with permanent
21 printed labels that correspond to control drawings. Temperature control junction and pullboxes shall be
22 identified utilizing spray painted green covers. Other electrical system identification shall follow the 26 05
23 53 specification.

24
25 All control devices and electrical boxes mounted on insulated ductwork shall be mounted over the insulation.
26 Provide mounting stand-offs where necessary for adequate support. Cutting and removal of insulation to
27 mount devices directly on ductwork is not acceptable. This contractor shall coordinate with the insulation
28 contractor to provide for continuous insulation of ductwork.

29
30 Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components.
31 Install all high voltage and low voltage wiring (includes low voltage cable) in rigid metal conduit. All conduit
32 must be installed in accordance with electrical sections (Division 26) of this specification and the National
33 Electrical code.

34
35 Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.

36
37 Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage
38 wiring to be stranded.

39
40 Low voltage wiring can be run without conduit above accessible lay-in tile ceilings. All wiring in mechanical
41 rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other
42 locations should be in conduit. Wire for wall sensors must be run in conduit.

43
44 Where wiring is installed free-air, installation shall consider the following:

- 45 • Wiring shall utilize the cable tray wherever possible.
- 46 • Wiring shall run at right angles and be kept clear of other trades work.
- 47 • Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling
48 concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall
49 be of open design (not a closed loop) to allow additional wire to be strung without being
50 threaded through the ring. For mounting rings that do not completely surround the wire, attach
51 the wire to the mounting ring with a strap.
- 52 • Supports shall be spaced at a maximum 4-foot interval unless limited by building construction.
53 If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
- 54 • Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling
55 grid wires.

- Wall penetrations shall be sleeved.

Wiring shall not be attached to existing cabling, existing tubing, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.

Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.

All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labelled as "Spare".

OWNER TRAINING

Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 8 hours over (2) separate days.

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.

COMMISSIONING, VERIFICATION AND CLOSEOUT

At the completion of the temperature controls system installation, and prior to substantial completion, the temperature control contractor shall verify and self-commission all HVAC building controls to verify all systems are calibrated, under control and functioning as specified and designed. Self-commissioning, verification and closeout shall include at a minimum:

- Verification that all points, alarms and equipment are integrated into the BAS and are graphically represented (accurately).
- Date self-commissioned.
- Exhaust Fans
 - Motorized or gravity backdraft damper operation.
 - On/off sequence.
 - Schedules coordinated with user.
- Ductless Split Cooling Systems
 - Heating and cooling operation.
 - Setpoints, deadbands, low/high limit temperature.
 - Alarms.
- 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.

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.

- Submit final report for review by the Owner, Owners Agent and A/E.
- Include final report in the Operation and Maintenance manuals.

1 **SEQUENCE OF OPERATION**

2

3 **SPLIT-SYSTEM DUCTED AIR-CONDITIONING UNITS (DSE-1 thru DSE-4)**

4 System consists of:

5

- Space thermostat/controller by unit manufacturer.

6

- DX heat pump cooling/heating coil.

7

- DDC discharge air temperature sensor.

8

- DDC current sensing switch.

9

10 The space thermostat/controller shall control the unit cooling or heating and associated condensing unit to
11 maintain space temperature. Unit supply fan shall operate continuously during the occupied mode. The
12 supply fan shall cycle as needed for cooling during the unoccupied mode.

13

14 When space temperature is above setpoint, energize the cooling cycle and associated condensing unit to
15 maintain temperature setpoint. The reverse shall occur when space temperature is below setpoint.

16

17 When space temperature is below setpoint, energize the heating cycle and associated condensing unit to
18 maintain temperature setpoint. The reverse shall occur when space temperature is above setpoint.

19

20 Provide a discharge temperature sensor for DDC integration/monitoring purposes. Provide high/low alarm.

21

22 Provide a current sensing switch on heat pump for DDC integration/monitoring purposes (unit ON/OFF).

23

24 **EXHAUST FAN (EF-1)**

25 System consists of:

26

- Powered roof exhaust fan.

27

- Motorized exhaust damper.

28

29 Fan shall be interlocked thru the BAS to operate with existing AC-4 (E), in the occupied mode. When the
30 fan is energized, the motorized exhaust damper shall open. When the fan is turned “off”, the motorized
31 exhaust damper shall close. Fan shall not operate during the unoccupied mode of existing AC-4 (E).

32

33 An exhaust fan failure alarm shall be sent to the BAS if the exhaust fan is commanded ON but a positive
34 status signal is not received to verify fan operation. Fan failure is detected via a current switch mounted on
35 the electrical power leads to the motor. The exhaust damper shall close during a fan failure.

36

37 **EXHAUST FAN (EF-2)**

38 System consists of:

39

- Powered roof exhaust fan.

40

- Motorized exhaust damper.

41

42 Fan shall be interlocked thru the BAS to operate with existing AC-1 (E), in the occupied mode. When the
43 fan is energized, the motorized exhaust damper shall open. When the fan is turned “off”, the motorized
44 exhaust damper shall close. Fan shall not operate during the unoccupied mode of existing AC-1 (E).

45

46 An exhaust fan failure alarm shall be sent to the BAS if the exhaust fan is commanded ON but a positive
47 status signal is not received to verify fan operation. Fan failure is detected via a current switch mounted on
48 the electrical power leads to the motor. The exhaust damper shall close during a fan failure.

49

50

END OF SECTION

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SECTION 23 22 13
STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

SCOPE

This section contains specifications for steam and condensate heating piping for this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS

- Low Pressure Steam (15 psig and lower)
- Steam Condensate Pump Discharge
- Unions and Flanges
- Gaskets

PART 3 - EXECUTION

- Preparation
- Erection
- Welded Pipe Joints
- Threaded Pipe Joints
- Steam and Steam Condensate
- Steam Condensate Pump Discharge
- Unions and Flanges
- Gaskets
- Piping System Leak Tests
- Piping System Leakage Test Report

RELATED WORK

- Section 23 05 15 - Piping Specialties
- Section 23 05 23 - General-Duty Valves for HVAC Piping
- Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- Section 23 07 00 - HVAC Insulation
- Section 23 25 00 - HVAC Water Treatment.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

- ANSI B16.4 Cast Iron Threaded Fittings
- ANSI B16.5 Pipe Flanges and Flanged Fittings
- ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
- ASTM A105 Forgings, Carbon Steel, for Piping Components
- ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

- 1 ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated
2 Temperatures
3 ASTM A380 Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
4

5 **SHOP DRAWINGS**

6 Refer to division 1, General Conditions, Submittals.
7

8 Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed
9 along with its type and grade and sufficient information to indicate the type and rating of fittings for each
10 service.
11

12 **QUALITY ASSURANCE**

13 Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or
14 each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.
15

16 Any installed material not meeting the specification requirements must be replaced with material that meets
17 these specifications without additional cost to the Owner.
18

19 **DELIVERY, STORAGE, AND HANDLING**

20 Promptly inspect shipments to insure that the material is undamaged and complies with specifications.
21

22 Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do
23 not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where
24 end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges,
25 and unions by storage inside or by durable, waterproof, above ground packaging.
26

27 Offsite storage agreements will not relieve the contractor from using proper storage techniques.
28

29 Storage and protection methods must allow inspection to verify products.
30

31 **DESIGN CRITERIA**

32 Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM
33 specifications as listed in this specification.
34

35 Construct all piping for the highest pressures and temperatures in the respective system in accordance with
36 ANSI B31, but not less than 125 psig unless specifically indicated otherwise.
37

38 Where weld fittings fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe
39 diameters.
40

41 Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E
42 or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53
43 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor
44 may choose from those commercially available.
45

46 **WELDER QUALIFICATIONS**

47 Welding procedures, welders, and welding operators for all building service piping and steam piping less
48 than or equal to 15 psig to be in accordance with certified welding procedures of the National Certified
49 Pipe Welding Bureau.
50

51 Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure
52 Specification together with the Procedure Qualification Record as required by Section IX of the ASME
53 Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.
54

1 The A/E reserves the right to test the work of any welder employed on the project, at the Contractor's
2 expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing
3 further welding on the project.
4

5 6 **PART 2 - PRODUCTS**

7 8 **LOW PRESSURE STEAM (15 psig and lower)**

9 2" and Smaller above grade in buildings: ASTM A53, type F, standard weight (schedule 40) black steel
10 pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.

11
12 2-1/2" and Larger: ASTM A53, standard weight (schedule 40) black steel pipe with ASTM A234 grade
13 WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.
14

15 **LOW PRESSURE STEAM CONDENSATE (Steam pressure 15 psig and lower)**

16 2" and Smaller above grade in buildings: ASTM A53, type F, extra strong (schedule 80) black steel pipe
17 with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.
18

19 2-1/2" and Larger: ASTM A53, extra strong (schedule 80) black steel pipe with ASTM A234 grade
20 WPB/ANSI B16.9, extra strong, seamless, carbon steel weld fittings.
21

22 **STEAM CONDENSATE PUMP DISCHARGE**

23 2" and Smaller in buildings: ASTM A53, type F, extra strong (schedule 80) black steel pipe with ASTM
24 A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.
25

26 2-1/2" and Larger: ASTM A53, extra strong (schedule 80) black steel pipe with ASTM A234 grade
27 WPB/ANSI B16.9 extra strong, seamless, carbon steel weld fittings.
28

29 **UNIONS AND FLANGES**

30 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron
31 on black steel piping and galvanized malleable iron on galvanized steel piping. Use ANSI B16.18 cast
32 copper alloy unions on copper piping. Use unions of a pressure class equal to or higher than that specified
33 for the fittings of the respective piping service but not less than 250 psi.
34

35 2-1/2" and Larger: ASTM A181 grade I or A105, grade III hot forged steel weld neck flanges, welding and
36 of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective
37 piping service. Flanges smaller than 2-1/2" may be used as needed for connecting to equipment and piping
38 specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment
39 with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with
40 other flat face flanges on equipment. Slip on flanges are not allowed without written A/E approval.
41

42 Provide ASTM A 193 B7 grade bolts and A 194 2H grade nuts & hardened washers for connections (Use
43 star washers when required for grounding.)
44

45 **GASKETS**

46 Steam Systems and high pressure steam condensate systems: Spiral wound gasket with external ring to
47 prevent gasket blowout, ASME B16.20. Suitable for use with flat face and raised face flanges. 304 stainless
48 steel/non-asbestos filler/carbon steel outer guide ring. Filler to be graphite or PTFE on low pressure
49 systems, 900 degree F graphite or ceramic on high pressure steam. Flexitallic Style CG, Leader Style SR,
50 Garlock Flexseal or approved equal.
51

52 Low pressure steam condensate, pumped condensate, feedwater and blowdown: Branded, compressed, non-
53 asbestos sheet gaskets. Klingersil C4401, Garlock 3000, JM Clipper 978-C or approved equal.
54
55

1 **PART 3 - EXECUTION**

2
3 **PREPARATION**

4 Remove all foreign material from interior and exterior of pipe and fittings.

5
6 **ERECTION**

7 Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a
8 window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute
9 piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe
10 spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

11
12 Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and
13 contract without damage to itself, equipment, or building.

14
15 All pipe shall be installed with adequate space to fully insulate the pipe, minor alignment offsets to provide
16 adequate spacing for the pipes shall have no additional cost to the project.

17
18 Mitered elbows, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings
19 are not acceptable.

20
21 Pipe tees shall be used for all branch takeoffs and tees except "Weldolets" and "Threadolets" may be used
22 for branch takeoffs up to one-half (1/2) the diameter of the main. All other branch takeoff and tee fittings
23 are unacceptable.

24
25 Do not route piping through transformer vaults or above transformers, panelboards, or switchboards,
26 including the required service space for this equipment, unless the piping is serving this equipment

27
28 Install all valves, control valves, and piping specialties, including items furnished by others, as specified
29 and/or detailed. Make connections to all equipment installed by others where that equipment requires the
30 piping services indicated in this section.

31
32 **WELDED PIPE JOINTS**

33 Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes
34 where applicable.

35
36 All pipe welding shall be completed by Qualified Welders in accordance with the Contractor's Procedure
37 Specifications.

38
39 Contractor will ensure that these steps are followed where pipe sections will be joined by welding:

- 40 1. Cleaning – Welding surfaces will be clean and free of defects.
- 41 2. Alignment – Inside diameter of piping components will be aligned as accurately as possible.
42 Internal misalignment shall not exceed 1/16".
- 43 3. Spacing – Pipe sections will be spaced to allow deposition of weld filler material through the entire
44 weld joint thickness.
- 45 4. Girth Butt Welds:
 - 46 a. Girth butt welds shall be complete penetration welds.
 - 47 b. Concavity will not exceed 1/32"
 - 48 c. Under cuts will not exceed 1/32"
 - 49 d. As welded surfaces are permitted however surfaces will be free from coarse ripples,
50 grooves, abrupt ridges and valleys.

51
52 Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the
53 manufacturer for the type and thickness of work being done.

54
55 All welds shall be painted/primed with high temperature paint rated for 450°F minimum continuous
56 working temperature.

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THREADED PIPE JOINTS

Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

STEAM AND STEAM CONDENSATE

Pitch mains down 1 inch in 40 feet in the direction of flow. Pitch terminal equipment runouts down 1 inch in 2 feet for proper condensate drainage.

Install drip traps at each rise, at the horizontal termination of each steam main and as needed to prevent water hammer but at a maximum spacing of 250 ft..

Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper condensate drainage. Concentric fittings may be used for changes in vertical pipe sizes.

Make branch connections and runouts at the top of the main or 45 degrees from the top. Condensate connections may be made in the horizontal plane in limited space situations.

Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping system. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

Install flanges, taps, vents and drains needed to fill, vent and drain the piping for hydrostatic testing.

STEAM CONDENSATE PUMP DISCHARGE

Pitch mains down 1 inch in 40 feet in the direction of flow. In limited space situations and where specifically indicated on the drawings, horizontal lines may be run dead level. Where two separate pump discharge mains join together, provide a check valve in each line before the tee and a gate valve for line isolation in an accessible location.

UNIONS AND FLANGES

Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

GASKETS

Store horizontally in cool, dry location and protect from sunlight, water and chemicals. Inspect flange surfaces for warping, radial scoring or heavy tool marks. Inspect fasteners, nuts and washers for burrs or cracks. Replace defective materials.

Align flanges parallel and perpendicular with bolt holes centered without using excessive force. Center gasket in opening. Lubricate fastener threads, nuts and washers with lubricant formulated for application.

Draw flanges together evenly to avoid pinching gasket. Tighten fasteners in cross pattern sequence (12 – 6 o'clock, 3 – 9 o'clock, etc.), one pass by hand and four passes by torque wrench at 30% full torque, 60% full torque and two passes at full torque per ASME B16.5. Retighten bolts after 24 hours of operation at system pressure and temperature. Bolts to have a minimum of two complete threads showing through the nut.

PIPING SYSTEM LEAK TESTS (HYDROSTATIC TEST)

Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

1 On piping that cannot be tested because of connection to an active line, provide temporary blind flanges
2 and hydrostatically test new section of piping. After completion of test, remove temporary flanges and
3 make final connections to piping

4
5 Provide all piping, fittings, blind flanges, and equipment to perform the testing.

6
7 Conduct pressure test with test medium of water unless specifically indicated. Minimum test time is
8 indicated in the table below; additional time may be necessary to conduct an examination for leakage.
9 Each test must be witnessed by the Division's representative. If leaks are found, repair the area with new
10 materials and repeat the test; caulking will not be acceptable.

11
12 Do not insulate pipe until it has been successfully tested.

13
14 For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents
15 or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

16

<u>System</u>	<u>Pressure</u>	<u>Medium</u>	<u>Duration</u>
Low pressure steam and condensate	100 psig	Water	8 hr
Steam condensate pump discharge	100 psig	Water	8 hr

17
18 All pressure tests are to be documented on form included in this specification.

19
20
21

END OF SECTION

PIPING SYSTEM LEAKAGE TEST REPORT

Date Submitted: _____

Project Name: _____

Location: _____ **Project No:** _____

Contractor: _____

- | | | | |
|--------------------------------------|----------------------------------------|------------------------------------|--------------------------------------|
| <input type="checkbox"/> HVAC | <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Controls | |
| <input type="checkbox"/> Power Plant | <input type="checkbox"/> Plumbing | <input type="checkbox"/> Sprinkler | |
| Test Medium: | <input type="checkbox"/> Air | <input type="checkbox"/> Water | <input type="checkbox"/> 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: _____

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SECTION 23 25 00
HVAC WATER TREATMENT

PART 1 - GENERAL

SCOPE

This section includes specifications for chemical treatment of all water, steam, and condensate systems. Included are the following topics:

PART 1 - GENERAL

- Scope
- Reference
- Related Work
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- Manufacturers
- System Cleaner

PART 3 - EXECUTION

- Preparation
- Cleaning Sequence

REFERENCE

Applicable provisions of Division 1 shall govern work under this Section.

RELATED WORK

Section 23 05 15 - Piping Specialties

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Required for all equipment and chemicals specified including data concerning dimensions, capacities, materials of construction, weights, operating sequence, composite wiring diagrams and appropriate identification. Chemical data to include the description of the chemical, its composition, its function, and the associated material safety data sheet.

OPERATION AND MAINTENANCE DATA

Provide for the services of the manufacturer's trained representative to approve the installation and instruct the user agency in the operation of each system.

Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

DESIGN CRITERIA

Clean the following systems:

- New steam and steam condensate piping

1 **PART 2 - PRODUCTS**

2
3 **MANUFACTURERS**

4 Betz Entac, Dearborn Div. - W. R. Grace & Co., Fremont Industries, Mitco Water Labs, Mogul
5 Corporation, Nalco Chemical Co., Western Water Management, or approved equal.

6
7 **SYSTEM CLEANER**

8 Blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors that remove grease
9 and petroleum products from the interior of piping systems. Cleaners that contain trisodium phosphate are
10 specifically not acceptable.

11
12
13 **PART 3 - EXECUTION**

14
15 **PREPARATION**

16 Prior to cleaning, verify that systems are operational, filled, started, and vented. Use water meter to record
17 capacity in each system.

18
19 **CLEANING SEQUENCE**

20
21 **GENERAL:**

22 Systems are to be cleaned before they are used for any purpose except conduct pressure test before
23 cleaning. Add cleaner to closed systems at concentrations as recommended by the manufacturer.

24
25 Use neutralizer agents on recommendation of the system cleaner supplier and approval of the
26 Architect/Engineer.

27
28 Flush system with clean water for one hour minimum. Drain completely and refill.

29
30 Remove, clean, and replace strainer screens.

31
32 Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include
33 disassembly of components as required.

34
35 **END OF SECTION**

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SECTION 23 31 00
HVAC DUCTS and CASINGS

PART 1 - GENERAL

SCOPE

This section includes specifications for all duct systems used on this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS

- General
- Materials
 - High Pressure Ductwork (Pressure class 3 inch and over)
 - Low Pressure Ductwork (Maximum 2 inch pressure class)
 - Exhaust Duct (Moisture laden air)
- Duct Sealant
- Gaskets

PART 3 - EXECUTION

- Installation
 - High Pressure Duct (Pressure class 3 inch and over)
 - Low Pressure Duct (Maximum 2 inch pressure class)
 - Exhaust Duct (Moisture laden air)
- Cleaning
- Leakage Test

APPENDIX

- Duct Leakage Test Report

RELATED WORK

- Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- Section 23 33 00 – Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

ANSI SS-EN 485-2	Aluminum and Aluminum Alloys-Sheet, Strip and Plate-Part 2: Mechanical Properties
ASTM B209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A167	Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A623	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A527	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM 924	Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
ASTM C 1071	Specification for Fibrous Glass Duct Lining Insulation
ASTM C 411	Test Method for Hot Surface Performance of High Temperature Thermal Insulation

1	ASTM E 84	Test Method for Surface Burning Characteristics of Building Materials
2	ASTM C 1338	Test Method for Determining Fungal Resistance of Insulation Materials
3		and Facings
4	ASTM G 21	Standard Practice for Determining Resistance of Synthetic Polymeric Materials
5	to	
6		Fungi
7	ASTM C 916	Standard Specification for Adhesives for Duct Thermal Insulation
8		Standard for the Installation of Air Conditioning and Ventilating Systems
9	UL 181	Standard for Safety for Factory Made Air Ducts and Air Connectors.
10	NAIMA	Fibrous Glass Duct Liner Standard

11
12 **QUALITY ASSURANCE**

13 Refer to division 1, General Conditions, Equals and Substitutions.

14
15 **SHOP DRAWINGS**

16 Refer to division 1, General Conditions, Submittals.

17
18 Include manufacturer's data and/or Contractor data for the following:

- 19 • Fabrication and installation drawings. Drawings shall be provided prior to duct
- 20 fabrication or installation.
- 21 • Schedule of duct systems including material of construction, gauge, pressure class,
- 22 system class, method of reinforcement, joint construction, fitting construction, and
- 23 support methods, all with details as appropriate.
- 24 • Duct sealant and gasket material.
- 25 • Duct liner including data on thermal conductivity, air friction correction factor, and
- 26 limitation on temperature and velocity.

27
28 **DESIGN CRITERIA**

29 Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under

30 specified operating conditions.

31
32 Use material, weight, thickness, gauge, construction and installation methods as outlined in the following

33 SMACNA publications, unless noted otherwise:

- 34 • HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
- 35 • HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
- 36 • HVAC Systems - Duct Design, 4th Edition, 2006
- 37 • Rectangular Industrial Duct Construction Standard, 2nd Edition, 2004
- 38 • Round Industrial Duct Construction Standards, 2nd Edition, 1999
- 39 • Thermoplastic Duct (PVC) Construction Manual, 2nd Edition, 1995

40
41 Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke

42 developed rating no higher than 50.

43
44 **DELIVERY, STORAGE AND HANDLING**

45 Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.

46
47 Protect Ductwork against damage.

48
49 Protect Ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store

50 material on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end

51 caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.

52
53 Offsite storage agreements do not relieve the contractor from using proper storage techniques.

54
55 Storage and protection methods must allow inspection to verify products.

1
2
3 **PART 2 - PRODUCTS**

4 **GENERAL**

5 All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral
6 ductwork and spiral duct take-offs 12” and below may be 26 gauge where allowed in SMACNA HVAC
7 Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005.

8 Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net,
9 inside of liner.

10
11 **DUCTWORK PRESSURE CLASS**

12 Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2 inch W.G. positive
13 or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1
14 inch W.G. positive or negative, depending on the application. Duct system pressure classes not indicated on
15 the drawings to be as follows:

16

17 Supply duct (AC(E) Units)	4.0 in. pressure class
18 Supply duct (DSE Units)	2.0 in. pressure class
19 Transfer air ducts	1.0 in. pressure class
20 Exhaust air ducts	2.0 in. pressure class
21 Return air ducts	2.0 in. pressure class
22 Outside air ducts	2.0 in. pressure class
23 Mixed air ducts	2.0 in. pressure class

24

25 **MATERIALS**

26 **GALVANIZED STEEL SHEET:**

27 Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per
28 square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide “Paint Grip” finish or
29 galvanneal sheetmetal for ductwork that will be painted.

30
31 **ALUMINUM SHEET:**

32 Use ANSI/ASTM B209 aluminum sheet, alloy 3003H-14, capable of double seaming without fracture.

33
34 **HIGH PRESSURE DUCTWORK (Pressure class 3 inch and over)**

35 Manufacturers: Ajax, Semco, United Sheet Metal, Sheet Metal Connectors or approved equal.

36
37 Machine formed round and/or flat oval spiral lock seam duct constructed of galvanized steel.

38
39 Rectangular high pressure duct using a transverse joint system as manufactured by Ductmate, Nexus,
40 TDC, TDF, or approved equal, may be used at contractor's option. Duct to be flanged, gasketed and sealed.

41
42 Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval
43 of Architect/Engineer. Submit construction details, a description of materials to be used, type of service,
44 reinforcing methods, and sealing procedures.

45
46 Use cemented slip joints with 2 inch minimum overlap, flanged connections, or welded/brazed connections,
47 unless noted otherwise for special applications. Prime coat welded joints.

48
49 Provide standard 90 degree conical tee takeoffs except for exhaust at velocities over 2000 feet per minute,
50 use 45° lateral connections; straight taps or bullhead tees are not acceptable.

51
52 Internal bracing will not be accepted on ductwork below 48 inches.

53
54 Use turning vanes as specified in Section 23 33 12.

55
56 Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.

57
58 Provide pressure relief fittings as indicated on the plans and/or details.

59
60 Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

61
62 **LOW PRESSURE DUCTWORK (Maximum 2 inch pressure class)**

63 Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA
64 recommendations, except as modified below.

1 Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction
2 when fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral
3 ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA
4 approved locations if the screw does not extend more than 1/2 inch into the duct.
5

6 Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits.
7 When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in
8 accordance with SMACNA publications, Type RE 3. Where space will not allow and the C value of the
9 radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes
10 as specified in Section 23 33 00. Square throat-radius heel elbows will not be acceptable. Straight taps or
11 bullhead tees are not acceptable.
12

13 Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.
14

15 Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork
16 airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be
17 accepted.
18

19 Button punch snaplock construction will not be accepted on aluminum ductwork.
20

21 Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of
22 equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by
23 written permission of the Architect/Engineer.
24

25 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence
26 upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
27

28 **EXHAUST DUCT (Moisture laden air)**

29

30 Moisture laden ductwork systems include exhaust ductwork that serve shower rooms.
31

32 Exhaust ducts conveying moisture laden air to be constructed of sheet aluminum in accordance with the
33 pressure class listed in this specification.
34

35 Seal all joints and seams watertight
36

37 **DUCT SEALANT**

38 Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peal & Seal, Lockformer cold
39 sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in
40 any type of ductwork installation.
41

42 Install sealants in strict accordance with manufacturer's recommendations, paying special attention to
43 temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup
44 of air handling systems.
45

46 **GASKETS**

47 **2 INCH PRESSURE CLASS AND LOWER:**

48 Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.
49

50 **3 INCH PRESSURE CLASS AND HIGHER:**

51 Butyl gaskets.
52
53

54 **PART 3 - EXECUTION**

55 **INSTALLATION**

56 Verify dimensions at the site, making field measurements and drawings necessary for fabrication and
57 erection. Check plans showing work of other trades and consult with Architect in the event of any
58 interference.
59

60 Make allowances for beams, pipes or other obstructions in building construction and for work of other
61 contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct
62 Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and
63 do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts,
64

1 construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In
2 all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or
3 fume exhaust ductwork.

4
5 Test openings for test and balance work will be provided under Section 23 05 93.

6
7 Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in
8 duct systems, and make all connections to such equipment including equipment furnished by others.
9 Secure frames with gaskets and screws or nut, bolts and washers.

10
11 Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to
12 form watertight joints.

13
14 Where two different metal ducts meet, the joint shall be installed in such a manner that metal ducts do not
15 contact each other by using proper seal or compound.

16
17 Install all motor operated dampers and connect to or install all equipment furnished by others. Blank off all
18 unused portions of louvers, as indicated on the drawings, with 1-1/2 inch board insulation with galvanized
19 sheet metal backing on both sides.

20
21 Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this
22 room or space.

23
24 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

25
26 Provide adequate access to ductwork for cleaning purposes.

27
28 Provide temporary capping of ductwork openings to prevent entry of dirt, dust and foreign material.

29
30 Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to
31 maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the Ductwork.

32
33 During construction provide temporary closures of metal or taped polyethylene on open ductwork to
34 prevent construction dust from entering ductwork system.

35 36 **DUCTWORK SUPPORT**

37 Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5-5, except
38 supporting ductwork with secure wire method is not allowed.

39
40 Stainless steel air-craft cable hanging systems are allowed on round ductwork under 12 inches diameter if
41 installed utilizing two fasteners with two cable loops. Support with 3/32 inch, 7 x 7, stainless steel air-craft
42 cable, with matching serrated spring loaded wedge mechanism fasteners rated for actual load. Comply with
43 the manufacturer's installation instructions.

44 45 **HIGH PRESSURE DUCT (Pressure class 3 inch and over)**

46 Seal all duct in accordance with SMACNA seal class "A"; all seams, joints, and penetrations shall be
47 sealed.

48
49 Single wall high pressure ductwork shall be installed for existing air handling unit supply air ductwork at
50 AC-1(E) and AC-4(E) as shown on the plans.

51 52 **LOW PRESSURE DUCT (Maximum 2 inch pressure class)**

53 Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal class "A"; all seams,
54 joints, and penetrations shall be sealed.

55
56 Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter
57 dampers, extractors, or grille face dampers will not be accepted for balancing dampers.

58
59 Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws
60 or pop rivets. Trapeze hangers may be used at contractor's option.

61
62

1 **EXHAUST DUCT (Moisture laden air)**

2 Pitch duct to drain back to equipment or exhaust grille.

3
4 Provide water tight drain pan at low points or at locations where moisture may collect. Pipe drain pan to
5 nearest floor drain.

6
7 **CLEANING**

8 Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the
9 inside of air-handling units before operating fans.

10
11 Clean duct systems with high power vacuum machines where systems have been used for temporary heat,
12 air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by
13 excessive dirt with filters, or bypass during cleaning.

14
15 **LEAKAGE TEST**

16 Test all ductwork associated with AC-1(E) and AC-4(E) in accordance with test methods described in
17 Section 5 of SMACNA HVAC Air Duct Leakage Test Manual. Do not insulate ductwork until it has been
18 successfully tested. Test pressure shall be equal to the duct pressure class.

19
20 If excessive air leakage is found locate leaks, repair the duct in the area of the leak, seal the duct, and retest.

21
22 Leakage rate shall not exceed more than 5% of the system air quantity for low pressure ductwork,
23 determined in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual.

24
25 Leakage rate shall not exceed more than 1% of the system air quantity for high pressure ductwork,
26 determined in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual.

27
28 Submit a signed report to the A/E, indicating test apparatus used, results of the leakage test, and any
29 remedial work required to bring duct systems into compliance with specified leakage rates.

DUCT LEAKAGE TEST REPORT

Coliseum Locker Room Remodel Alliant Energy Center	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 the reverse side for a simple sketch of the entire duct system. Then use letter designations to indicate the various duct sections being tested at one time. Also use the 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												

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

SCOPE

This sections includes accessories used in the installation of duct systems. Included are the following topics:

PART 1 - GENERAL

- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data

PART 2 - PRODUCTS

- Manual Volume Dampers
- Turning Vanes
- Control Dampers
- Access Doors
- Flexible Duct
- Duct Flexible Connections

PART 3 - EXECUTION

- Manual Volume Dampers
- Turning Vanes
- Control Dampers
- Access Doors
- Duct Flexible Connections

RELATED WORK

Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment
Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
Section 23 31 00 – HVAC Ducts and Casings

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition, 2005
UL 214
UL 555 (6th edition) Standard for Fire Dampers and Ceiling Dampers
UL 555S (4th edition) Leakage Rated Dampers for Use in Smoke Control Systems

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.

1 Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance
2 of sound attenuators.

3
4 Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

5
6 **OPERATION AND MAINTENANCE DATA**

7 All operations and maintenance data shall comply with the submission and content requirements specified
8 under section GENERAL REQUIREMENTS.

9
10 **PART 2 - PRODUCTS**

11
12 **MANUAL VOLUME DAMPERS**

13 Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.

14
15 Dampers must be constructed in accordance with SMACNA Fig. 7-4, Fig. 7-5, and notes relating to these
16 figures, except as modified below.

17
18 Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections
19 with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components;
20 sheet metal screws will not be accepted. Provide operators with locking devices and damper position
21 indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings
22 for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

23
24 **TURNING VANES**

25 Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.

26
27 Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 4-3 and Fig. 4-4
28 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one
29 dimension changes in the turn in accordance with SMACNA Chart 4-1 and Fig. 4-9.

30
31 **CONTROL DAMPERS**

32 Provide control dampers shown on the plans and as required to perform the specified functions. Dampers
33 shall be rated for velocities that will be encountered at maximum system design and rated for pressure
34 equal or greater than the ductwork pressure class as specified in Section 23 31 00 of the ductwork where
35 the damper is installed.

36
37 Use only factory fabricated dampers with mechanically captured replaceable resilient blade seals, stainless
38 steel jamb seals and with entire assembly suitable for the maximum temperature and air velocities
39 encountered in the system.

40
41 Dampers in galvanized ductwork shall be constructed of galvanized steel and/or aluminum.

42
43 All dampers, unless otherwise specified, to be rated at a minimum of 180° F working temperature. Leakage
44 testing shall be certified to be based on latest edition of AMCA Standard 500-D and all dampers, unless
45 otherwise specified, shall have leakage ratings as follows:

Damper Class	Differential Pressure	Leakage
Class IA	1" w.g.	≤3 CFM/ft ²

46
47
48
49 Leakage rate dampers for differential pressures that they will encounter at maximum system design
50 pressures.

51
52 Aluminum frame and blade dampers: Nailor models 2010EAF & 202EAF; Greenheck model VCD-43;
53 Ruskin model CD50; Arrow model AFD-20; other approved equal.

54
55 Two position dampers may be parallel or opposed blade type.

1 Dampers for to have frames of not less than 16 gauge galvanized steel or 12 gauge extruded aluminum.
2 Blades to be two-ply steel airfoil of not less than 2 x 20 gauge galvanized steel (14 gauge equivalent) or
3 extruded aluminum airfoil, with stainless steel, acetal, Celcon, bronze, or nylon bearings. Maximum
4 allowable blade width is 8 inches. Use plated steel linkage hardware.
5

6 Jack shafts shall be extended outside of the ductwork for external actuator mounting. Provide bearings on
7 the point of exit for support of damper shafts to prevent wear on the shaft and the ductwork. If locating
8 actuators out of the air stream is impossible, obtain mounting location approval from the designer unless
9 the contract documents indicate in air stream mounting is acceptable.
10

11 Provide weatherproof NEMA 4 enclosures (Belimo N4 option or equal, Belimo ZS-100 or ZS-150 are not
12 acceptable) that have removable covers that have clasps or machine screws (no sheet metal screws) and that
13 do not require removing fasteners from the ductwork to prevent actuator failure or freeze-up when
14 mounting in locations exposed to harsh environments or outdoor locations.
15

16 Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to
17 provide tight shutoff against system temperatures and pressure encountered. For pneumatic actuation, use
18 rolling diaphragm, piston type operators with adjustable stops. For electric modulating actuation, use fully
19 proportional actuators with zero and span adjustments. For two-position electric actuation use 24 VAC for
20 DDC controlled actuators, 120 VAC actuators may be used for hardwire interlocking. See 23 09 15 for
21 specific type of input signal required. Actuator stroke times shall match the requirements of the DDC
22 controllers provided under 23 09 23, 23 09 24, and 23 09 25 and/or the specific system requirements for
23 proper operation. All electric actuators will be provided with overload protection to prevent motor from
24 damage when stall condition is encountered. Equip operators with spring return or stored energy fail-safe
25 return for applications involving fire, freeze protection, moisture protection or specified normally
26 open/closed operation.
27

28 All power required for electric actuation shall be provided by this contractor.
29

30 Provide operators with linkages and brackets for mounting on device served.
31

32 **ACCESS DOORS**

33 Access doors to be designed and constructed for the pressure class of the duct in which the door is to be
34 installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be aluminum or
35 steel full length continuous piano type. Doors in concealed spaces shall be secured in place with cam sash
36 latches. For both hinged and non-hinged doors provide sufficient number of camp sash latches to provide
37 air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict
38 access. Use minimum 1" deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge
39 galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with
40 frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene
41 gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are
42 installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is
43 provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners
44 will not be accepted.
45

46 **FLEXIBLE DUCT**

47 Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster or approved equal.
48

49 Factory fabricated , UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke
50 developed rating of 50 or under in accordance with NFPA 90A.
51

52 Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ±2 inch
53 pressure class, depending on the application.
54

1 Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded
2 permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum
3 construction may also be used.
4

5 Where duct is specified to be insulated, provide a minimum 1 inch fiberglass insulation blanket with
6 maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or
7 metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.
8

9 **DUCT FLEXIBLE CONNECTIONS**

10 Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA 90A.

11
12 Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and air tight. Connections
13 to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected
14 equipment, and other movement.
15

16 Use coated glass fiber fabric for all applications. Material for inside applications shall be double coated
17 with neoprene, air and water tight, suitable for temperatures between -10°F and 200°F, and have a nominal
18 weight of 30 ounces per square yard.
19

20 **PART 3 - EXECUTION**

21 **MANUAL VOLUME DAMPERS**

22
23 Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away
24 from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter
25 or vibration of the damper blade(s).
26
27

28 **TURNING VANES**

29 Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and/or
30 manufacturer's recommendations.
31

32 Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air
33 velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2 inch radius vanes in ducts with vane runner
34 length 18" or greater and air velocity 2000 fpm or greater.
35

36 If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct
37 size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in
38 accordance with SMACNA Chart 4-1 and Figure 4-9.
39

40 **CONTROL DAMPERS**

41 Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's
42 instructions. Install blank-off plates or transitions where required for proper mixing of airstreams in mixing
43 plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent
44 to each control damper for inspection and maintenance.
45

46 **ACCESS DOORS**

47 Install access doors where specified, indicated on the drawings, and in locations where maintenance,
48 service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers,
49 fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and
50 control devices needing periodic maintenance.
51

52 Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access
53 door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as
54 indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted
55 coils.
56

1 **FLEXIBLE DUCT**

2 Flexible duct may only be used for final connections of air inlets and outlets at diffuser, register, and grille
3 locations. Where flexible duct is used, it shall be the minimum length required to make the final
4 connections, but no greater than 4 feet in length, and have no more than one (1) 90 degree bend.

5
6 Secure inner jacket of flexible duct in place with stainless steel metal band clamp. Secure insulation vapor
7 barrier jacket in place with steel or nylon draw band. Sheetmetal screws and/or duct tape will not be
8 accepted.

9
10 Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.

11
12 Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will
13 not be accepted.

14
15 Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.

16
17 Penetration of any partition, wall, or floor with flexible duct will not be accepted.

18
19 **DUCT FLEXIBLE CONNECTIONS**

20 Install at all duct connections to rotating or vibrating equipment, including air handling units (unless unit is
21 internally isolated), fans, or other motorized equipment in accordance with SMACNA Figure 7-8.

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24

END OF SECTION

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SECTION 23 34 00
HVAC FANS

PART 1 - GENERAL

SCOPE

This section includes specifications for fans that are not an integral part of a manufactured device. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- General
- Power Roof Exhaust Fans

PART 3 - EXECUTION

- Installation

RELATED WORK

- Section 23 05 13 - Common Motor Requirements for HVAC Equipment
- Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

- AMCA 203 AMCA Fan Application Manual - Troubleshooting
- AMCA 210 Laboratory Method of Testing Fans for Rating
- AMCA 300 Reverberant Room Method for Sound Testing of Fans
- NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration isolation for all equipment. Sound power levels to be based on tests performed in accordance with AMCA Standard 300.

Submit color selection charts for equipment where applicable.

Fan curves shall indicate the relationship of CFM to static or total pressure for various fan speeds. Brake horsepower, recommended selection range, and limits of operation are to also be indicated on the curves.

1 Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's
2 recommended drive loss factor for the specific application. Tabular fan performance data is not acceptable.
3

4 For variable air volume application, include data which indicates the effect of capacity control devices on
5 performance.
6

7 **OPERATION AND MAINTENANCE DATA**

8 All operations and maintenance data shall comply with the submission and content requirements specified
9 under section GENERAL REQUIREMENTS.
10

11 **DESIGN CRITERIA**

12 Tested and certify all fans in accordance with the applicable AMCA test code.
13

14 Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled
15 static pressure. The motor furnished with the fan shall not operate into the motor service factor when
16 operating under these conditions.
17

18 Consider drive efficiency in motor selection according to manufacturer's published recommendation or
19 according to AMCA Publication 203, Appendix L.
20

21 Where inlet and outlet ductwork at any fan is changed from that shown on the drawings, provide any
22 motor, drive and/or wiring changes required due to increased static pressure or baffling necessary to
23 prevent uneven airflow or improve mixing.
24

25 All internal insulation and other components exposed to the airstream are to meet the flame spread and
26 smoke ratings contained in NFPA 90A.
27

28 All roof mounted equipment to be provided with curbs or equipment stands in accordance with
29 specification in Section 23 05 29.
30

31 **PART 2 - PRODUCTS**

32 **GENERAL**

33 Use fan size, class, type, arrangement, and capacity as scheduled.
34

35 Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, and
36 accessories required for specified performance and proper operation. All single phase motors to have
37 inherent thermal overload protection.
38

39 Provide variable pitch sheaves for drives 3 hp and smaller, fixed pitch sheaves for drives 5 hp and larger.
40 Design all drives for 150% of motor rating.
41

42 Use OSHA approved belt guards that totally enclose the entire drive. Construct guards of expanded metal
43 to allow for ventilation; provide tachometer openings at shaft locations.
44

45 Statically and dynamically balance all fans so they operate without objectionable noise or vibration.
46

47 **POWER ROOF EXHAUST FANS**

48 Manufacturers: Carnes, Greenheck, Penn, Jenn-Air, Cook, ACME, S&P or approved equal.
49

50 Provide upblast or downblast units, as scheduled, with aluminum housing, non-overloading type centrifugal
51 wheel, inlet cone, factory mounted and wired motor and disconnect switch, and bird screen. Fans to be
52 hinged / have hinged bracket and pin.
53

54 Provide with factory fabricated 18" high insulated roof curb.
55
56

1 Electrical Contractor will provide disconnect switches and thermal overload protection for units with three
2 phase motors.

3
4 See Section 23 33 00 for motor operated damper and actuator requirements.
5

6
7 **PART 3 - EXECUTION**

8
9 **INSTALLATION**

10 Install as shown on the drawings, as detailed, and according to manufacturer's installation instructions. On
11 units provided with a drain connection, reduce drain connection down to ½" fitting and leave open.

12
13 Install thrust restraints in accordance with the requirements of Section 23 05 48.

14
15 Contractor shall balance blade assembly of destratification fans after installation to assure stable operation.

16
17 **POWER ROOF EXHAUST FANS**

18 Contractor to provide roof penetration and curb.

19
20 See Section 23 33 00 for motor operated damper and actuator requirements.

21
22
23 **END OF SECTION**

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SECTION 23 37 13
DIFFUSERS, REGISTERS & GRILLES

PART 1 - GENERAL

SCOPE

This section includes specifications for air terminal equipment. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Submittals
- Design Criteria

PART 2 - PRODUCTS

- Manufacturers
- Side-Wall Registers and Grilles

PART 3 - EXECUTION

- Installation

RELATED WORK

- Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
- Section 23 31 00 - HVAC Ducts and Casings
- Section 23 33 00 - Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

- NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- UL 181 - Factory-Made Air Ducts and Connectors.
- ARI-ADC Standard 880

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Furnish submittal information including, but not limited to, the following:

- Manufacturer's name and model number
- Identification as referenced in the documents
- Capacities/ratings
- Materials of construction
- Sound ratings
- Dimensions
- Finish
- Color selection charts where applicable
- Manufacturer's installation instructions

1 All other appropriate data

2
3 **DESIGN CRITERIA**

4 All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test
5 Code 1062 GRD 84.

6
7 **PART 2 - PRODUCTS**

8
9 **MANUFACTURERS**

10 Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price, and United Sheet Metal.

11
12 Acceptable manufacturers for specific products are listed under each item.

13
14 **SIDE-WALL REGISTERS AND GRILLES**

15 Titus series 300 (supply) and series 350 (return/exhaust), Carnes model R series, Price model 620 (Supply)
16 or 630 (return/exhaust), Metal Aire series V4000 or H4000, Krueger series 880, Nailor 51DH.

17
18 Aluminum construction, with frame type appropriate to installation.

19
20 Double deflection type blade supply registers and supply grilles allow deflection adjustment in all direction.

21
22 Aluminum opposed blade volume control damper supply registers, operable from face.

23
24 Fixed blade, 45-degree core return and exhaust registers and grilles.

25
26 Register and grille sizes as shown on drawings and/or as scheduled.

27
28 White, baked enamel finish or powder coat finish, unless otherwise indicated.

29
30 Screw holes on surface counter sunk to accept recessed type screws.

31
32
33 **PART 3 - EXECUTION**

34
35 **INSTALLATION**

36 Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.

37
38 Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.

39
40 Seal connections between ductwork drops and diffusers/grilles airtight.

41
42 Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with
43 flat black paint to reduce visibility.

44
45
46 **END OF SECTION**

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SECTION 23 81 26
SPLIT-SYSTEM DUCTED HEAT PUMPS

PART 1 - GENERAL

SCOPE

This section includes specifications for split-system ducted heat pump and cooling only type systems. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Delivery, Storage and Handling
- Warranty

PART 2 – PRODUCTS

- Ducted Split System Heat Pump
- Cooling Coil Condensate Piping
- Integral Condensate Pump
- Refrigerant piping

PART 3 - EXECUTION

- Installation
- Refrigerant Piping Sizing
- Refrigerant Piping
- Refrigerant Piping Accessories
- Startup
- Owner Training

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC

REFERENCE

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

REFERENCE STANDARDS

- ARI 210/240 Unitary Air Conditioning and Heat Pump Equipment
- ARI 365 Commercial and Industrial Unitary Air Conditioning Condensing Units
- ASHRAE 15 Safety Standard for Refrigeration Systems
- ASHRAE 90.1 (2004 edition) Energy Standard for Buildings Except Low Rise Residential Buildings
- NEC National Electrical Code
- ASTM B117 Standard Practice for Operating Salt Spray (fog) Apparatus
- UL Underwriters Laboratory

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

Unit rated performance in accordance with the latest edition of ARI Standard 365 or ARI Standard 210/240, whichever is applicable for the equipment.

Construct units in accordance with ASHRAE 15, UL standards and the NEC. Units shall carry the UL label.

1
2 Factory run and test units to see that each control device operates properly. Pressure test, evacuate, charge
3 with holding charge of refrigerant and full oil charge prior to shipping from the factory.
4

5 **SUBMITTALS**

6 Refer to division 1, General Conditions, Submittals
7

8 Submit air cooled condensing unit and evaporative unit shop drawings including the following information:
9 specific manufacturer and model numbers, dimensional and weight data, required clearances, materials of
10 construction, capacities and ratings, efficiencies, stages of unloading capacity achievable without hot gas
11 bypass, refrigerant type and charge, component information, size and location of piping connections,
12 electrical connections, wiring diagrams and information for all specialties and accessories.
13

14 Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts
15 lists, controls and accessories.
16

17 At substantial completion, submit warranty certificate and copy of start-up report.
18

19 **OPERATION AND MAINTENANCE DATA**

20 All operations and maintenance data shall comply with the submission and content requirements specified
21 under section GENERAL REQUIREMENTS.
22

23 **DELIVERY, STORAGE AND HANDLING**

24 Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units
25 from physical damage. Leave factory-shipping covers in place until installation.
26

27 Ship units to jobsite fully assembled.
28

29 **WARRANTY**

30 Provide a one-year parts and labor warranty on the entire unit beginning upon substantial completion of
31 project.
32

33 Provide a five-year parts warranty on the compressor(s) beginning upon substantial completion of project.
34

35 **PART 2 – PRODUCTS**

36
37 **DUCTED SPLIT SYSTEM HEAT PUMP**

38 Manufacturers: Carrier, Daikin, Friedrich, Mitsubishi, Toshiba or approved equal.
39

40 **GENERAL**

41 Provide a heating and cooling Heat Pump unit with an indoor ceiling mounted ducted fan coil with matched
42 outdoor condensing unit as scheduled.
43

44 Indoor fan coil units shall be complete with coil, fan, fan motor, piping connectors, electrical controls,
45 microprocessor control system, R-410A or R32 refrigerant and integral Temperature sensing. Unit shall be
46 furnished with integral wall mounting bracket and mounting hardware.
47

48 Outdoor condensing unit shall be factory assembled suitable for floor mounting. Units shall consist of a
49 compressor, an air-cooled coil, propeller type outdoor fan, metering device(s), and control box. Units shall
50 discharge air horizontally or vertically as shown on the drawings.
51

52 **INDOOR FAN COIL UNIT (Ceiling Mounted Ducted)**

53 Unit cabinet shall be constructed of zinc coated steel. Provide fully insulated cabinet with discharge and inlet
54 grilles. Grilles shall have hinges and can be opened to obtain access to the filters, indoor fan motor and control
55 box.
56

1 Fans shall be centrifugal direct drive blower type with center intake and perimeter discharge on the unit.
2 Automatic, motor driven air vanes shall be provided.

3
4 Coils shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the
5 tubes by mechanical expansion and specially coated for enhanced wettability. A drip pan under the coil shall
6 have drain connections for hose attachment to remove condensate. Condensate pan shall be corrosion
7 resistant.

8
9 Motors shall have permanently lubricated ball bearing with inherent overload protection. Fan motors shall a
10 minimum of 3 speeds.

11 Unit shall have a filter track with factory supplied cleanable filters.

12
13 Minimum performance shall be 16.0 SEER and 10.0 HSPF for units.

14 AIR-COOLED HEAT PUMP UNIT

15
16 Unit cabinet shall be constructed of galvanized steel, bonderized, and coated with a baked enamel finish on
17 the inside and outside. Unit cabinet shall be capable of withstanding 500 hour salt spray test per Federal Test
18 Standard No. 141 (method 6061). Unit access panels shall be removable with minimal screws and shall
19 provide full access to the compressor, fans, and control components. Outdoor compartment shall be isolated
20 and have an acoustic lining.

21
22
23 Outdoor fans shall be direct drive propeller type and shall discharge air horizontally or vertically. Outdoor
24 fan motors shall be totally enclosed, single phase motors with class B insulation and permanently lubricated
25 bearings. Motor shall be protected by internal thermal overload protection and shafts shall have inherent
26 corrosion resistance.

27
28 Fan blades shall be statically and dynamically balanced.

29
30 Outdoor fan openings shall be equipped with protective grille over fan.

31
32 Compressor shall be fully hermetic scroll or a rotary swing type variable speed compressor. Compressor shall
33 be equipped with operating oil charge, and motor. Internal overloads shall protect the compressor from over
34 temperature and over current. Motor shall be NEMA rated class F, suitable for operation in a refrigerant
35 atmosphere. Compressor assembly shall be installed on rubber vibration isolators. Compressors shall be
36 provided with crankcase heater.

37
38 Outdoor coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, which
39 are cleaned, dehydrated, and sealed. Air cooled condenser coils shall be leak tested at 573 psig.

40
41 Refrigerant circuit components shall include service valves with service gage port connections on compressor
42 suction and discharge lines, each with brass caps, accumulator, and a reversing valve (for heat pump units).

43
44 Condensing unit controls and safeties shall be factory selected, assembled, and tested. The minimum control
45 functions shall include the following:

- 46 • A time delay control sequence.
- 47 • Outdoor fan failure detection.
- 48 • Compressor motor current and temperature overload protection.
- 49 • Compressor low and high pressure protection.

50 CONTROLS

51
52 Controls shall consist of a microprocessor based control system which shall control space temperature,
53 determine optimum fan speed, and run self-diagnostics. The temperature control range shall be from 62
54 degrees F to 84 degrees F (16.7 degrees C to 28.9 degrees C). User interface with the unit shall be
55 accomplished through a wired remote control (can be configured for degrees F or degrees C).

56 Unit shall include a BACnet interface controller that is fully compatible with the existing Metasys direct

1 digital building automation control system (DDC).

2
3 The unit shall have the following functions as a minimum:

- 4 • An automatic restart after power failure at the same operating conditions as at failure.
- 5 • A timer function to provide a minimum 24 hour timer cycle for system Auto Start/Stop.
- 6 • Temperature sensing controls shall sense return air temperature.
- 7 • Automatic air sweep control to provide on or off activation of air sweep louvers.
- 8 • Dehumidification mode shall provide increased latent removal capability by modulating system
9 operation and set point temperature.
- 10 • Fan only operation to provide room air circulation when no cooling or heating is required.
- 11 • Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions.
12 Error messages shall be displayed at the unit.
- 13 • Evaporator fan speed control shall be user selectable: high, medium, low, or microprocessor
14 controlled automatic operation during all operating modes.
- 15 • Automatic heating to cooling changeover. Control shall include dead band to prevent rapid mode
16 cycling between heating and cooling.
- 17 • A liquid level sensor in the condensate reservoir shall stop cooling operation if the liquid level in
18 the reservoir is too high.

19
20 **ELECTRICAL**

21 Unit's electrical requirements shall be 208/230 volt, single phase, and 60 hertz.

22
23 Division 26 contractor shall provide conduit for both the power and control wiring between indoor unit and
24 outdoor unit.

25
26 All power and control wiring must be installed per NEC and all local electrical codes.

27
28 **COOLING COIL CONDENSATE PIPING**

29 Provide ASTM B88, type L hard temper copper tubing with ASTM B145/ANSI B16.23 cast red bronze or
30 ASTM B75/ANSI B16.29 wrought solder-type drainage fittings.

31
32 **INTEGRAL CONDENSATE PUMP**

33 The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used.
34 Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor
35 assembly and a remote sound shielded pump assembly.

36
37 **REFRIGERANT PIPING**

38 Provide precharged refrigerant lines that can be oriented to connect to the side or back of unit. Both refrigerant
39 lines shall be insulated.

40
41 Provide all required refrigerant accessories for a complete operating system.

42
43 **PART 3 - EXECUTION**

44
45 **INSTALLATION**

46 Install units, piping and accessories in accordance with the manufacturer's written instructions and
47 recommendations. Mount condensing unit(s) as indicated on the drawings.

48
49 Provide duct flexible connection on indoor/evaporator units on duct inlet (return) and outlet (supply).

50
51 Maintain adequate service access and airflow clearances for all components as recommended by the
52 manufacturer and as indicated on the drawings.

53
54 Charge unit(s) with full oil charge and refrigerant charge based on the entire refrigeration system pipe size
55 and length.

1 Provide all control wiring in conduit in compliance with Section 23 09 14 or Section 23 09 15 and Division
2 26 00 00 - Electrical.

3
4 Coordinate power wiring requirements with Division 26 00 00 contractor.

5
6 **REFRIGERANT PIPING SIZING**

7 The unit manufacturer shall verify the final refrigeration pipe sizing process to insure conformance to specific
8 unit requirements such as maximum lengths, refrigerant velocities, unloading considerations and proper oil
9 return. This contractor shall provide refrigeration piping drawings from the field which details the way the
10 piping will actually be installed.

11
12 **REFRIGERANT PIPING**

13 Install per manufacturers recommendations and requirements.

14
15 Insulate piping per Section 23 07 00 requirements, including protective jacket.

16
17 **REFRIGERANT PIPING ACCESSORIES**

18 Install accessories in accordance with the manufacturer's written instructions and recommendations.

19
20 **STARTUP**

21 Adjust units for maximum operating efficiency, adjust all controls to required final settings and demonstrate
22 that all components are functioning properly. Submit four copies of a written startup report following the
23 initial startup. Include in the report: work done to the system, all readings taken, a statement certifying that
24 the refrigeration system(s) are leak free and a statement certifying that the unit(s) have been placed in proper
25 running condition as recommended by the manufacturer and as intended in the drawings and specifications.

26
27 **OWNER TRAINING**

28 Contractor to provide factory authorized representative and/or field personnel knowledgeable with the
29 operations, maintenance and troubleshooting of the system and/or components defined within this section for
30 a minimum period of 2 hours.

31
32

END OF SECTION

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SECTION 23 82 00
HEATING TERMINAL UNITS

PART 1 - GENERAL

SCOPE

This section includes specification for heating and cooling terminal equipment using water and/or steam as the source. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- Electric Heaters

PART 3 - EXECUTION

- Installation
- Electric Heaters

RELATED WORK

- Section 23 05 13 - Common Motor Requirements for HVAC Equipment
- Section 23 33 00 - Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

- ARI 210 Standard for Unitary Air-Conditioning Equipment
- ARI 410 Standard for Forced-Circulation Air-Cooling and Air-Heating Coils
- CS 140

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include dimensions, capacities, materials of construction, ratings, weights, wiring diagrams, and appropriate identification for all equipment in this section. Include color selection chart where applicable.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

DESIGN CRITERIA

Forced Circulation Coils: Ratings certified in accordance with ARI 410.

Electrical Equipment and heaters shall be UL listed for the service specified.

1
2 Electrical components and work must be in accordance with National Electrical Code.
3
4

5 **PART 2 - PRODUCTS**
6

7 **ELECTRIC HEATERS**

8 Manufacturers: Berko, Chromalox, Markel, Trane, or approved equal.
9

10 Use corrosion resistant heating elements, designed and spaced for even distribution of air across the heating
11 element, and installed to prevent noise of expansion and contraction.
12

13 Provide units with necessary overheat protection, reset devices, air flow interlock switch, contactors,
14 transformers, local non-fused disconnect switch that is prewired, and other controls as may be required by
15 codes. Provide with line to low voltage control transformer.
16

17 Provide with low voltage thermostat and controls to maintain fan operation until residual heat in the heating
18 elements has been dissipated. The fans and motors shall be balanced and mounted for vibration free
19 operation.
20

21 Construct cabinets of 20 gauge steel, furnished exposed cabinets with a baked enamel finish in one of the
22 manufacturer's standard colors, selected by Architect.
23
24

25 **PART 3 - EXECUTION**
26

27 **INSTALLATION**

28 Install units in accordance with manufacturer's installation instructions.
29

30 Coordinate location of units with other trades to assure correct recess size for recessed units.
31

32 After installation, provide protective covers to prevent accumulation of dirt on units during balance of
33 construction.
34

35 **ELECTRIC HEATERS**

36 Install units where indicated on the drawings and details.
37

38 Install low voltage thermostat. Provide low voltage control wiring from unit to thermostat routed within
39 conduit.
40

41 Units will be wired by the Electrical Contractor.
42
43

44 **END OF SECTION**

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1 SECTION 26 05 00

2
3 GENERAL ELECTRICAL REQUIREMENTS

4 PART 1 - GENERAL

5 1.01 SCOPE

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

8 1.02 GENERAL PROVISIONS

- 9 A. In general, the work includes: Electrical work and the kindred materials and operations as indicated
10 on the drawings and as specified in the following articles of:
11 Section 26 05 00 General Electrical Requirements
12 Section 26 09 23 Occupancy Sensor
13 Section 26 20 00 Basic Materials and Methods
14 Section 26 51 13 Lighting
15 Section 27 10 00 Telecommunications Distribution System
- 16 B. Job Information: Obtain at building including:
17 1. Conditions affecting this Section of the Work.
18 2. Accessibility
19 3. Storage space.

20 1.03 GENERAL REQUIREMENTS

- 21 A. This Section of the Specifications applies to all electrical work. The General Conditions,
22 Supplementary Conditions, Summary of the Work, Instructions to Bidders and all Sections of the
23 Conditions of the Contract form a part of these specifications and the Contractor shall consult them in
24 detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical
25 Contractor shall be included in the Work of this Section.

26 1.04 DEFINITIONS

- 27 A. Certain terms used herein; on the drawings; and in the contract documents, shall be defined as
28 follows:
- 29 B. Provide: Furnish and install complete and ready for service.
- 30 C. Exposed: Exposed to view in any room, hallway, passageway, or outside.
- 31 D. Approval: The approval of the Architect in writing or by signed rubber stamp applied to drawings,
32 illustrations, etc.

33 1.05 INTENT OF DRAWINGS AND SPECIFICATIONS

- 34 A. These specifications and attendant drawings are intended to cover a complete installation of systems.
35 The omission of expressed reference to any item of labor or material necessary for the proper
36 execution of the work in accordance with present practice of the trade shall not relieve the Contractor
37 from providing such additional labor and materials.

38 1.06 DRAWINGS

- 39 A. The Electrical drawings do not attempt to show the complete details of building construction which
40 affect the electrical installation. The Contractor shall refer to the architectural, civil, structural and
41 mechanical drawings for additional details which affect the proper installation of this work. The
42 Contractor is cautioned that diagrams showing electrical connections and/or circuiting are
43 diagrammatic only and must not be used for obtaining lineal runs of wire to conduit. Wiring diagrams
44 do not necessarily show the exact physical arrangement of the equipment.

1 1.07 MATERIAL AND EQUIPMENT

- 2 A. All material and equipment shall be new and of the quality used for the purpose in good commercial
3 practice and shall be standard product of reputable manufacturers. Each major component of
4 equipment shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate,
5 securely affixed on the equipment in a conspicuous place.

6 1.08 SUBSTITUTION AND APPROVAL OF MATERIAL

- 7 A. See Instructions to Bidders.
8 B. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings and
9 descriptions of material proposed for substitution and shall fully describe all points in which it differs
10 from the articles specified. Two copies will be retained by the Architect and one copy returned to the
11 Contractor with approval or revisions indicated thereon.

12 1.09 DAMAGE TO OTHER WORK

- 13 A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own or
14 any other trade resulting from the execution of his work. It shall be the Contractor's responsibility to
15 adequately protect his work at all times. All damages resulting from his operations shall be repaired
16 or the damaged portions replaced by the party originally performing the work, (to the entire
17 satisfaction of the Architect), and all cost thereof shall be borne by the Contractor responsible for the
18 damage.

19 1.10 COOPERATION WITH OTHER TRADES

- 20 A. This Contractor shall completely cooperate with all other trades in the matter of planning and
21 executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as
22 to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay
23 or obstruct the work of any trade.

24 1.11 NEGLIGENCE

- 25 A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing
26 delay or expense to another party, he shall pay the actual amount of the damages to the party who
27 sustained the loss.

28 1.12 FIELD CHANGES

- 29 A. Should any change in drawings or specifications be required to comply with local regulations and/or
30 field conditions, the Contractor shall refer same to Architect for approval before any work which
31 deviates from the original requirements of the drawings and specifications is started. In the event of
32 disagreements as to the necessity of such changes, the decision of the Architect shall be final.

33 1.13 CUTTING AND PATCHING IN NEW CONSTRUCTION

- 34 A. As necessary and with approval to permit the installation of conduit or any part of the work under this
35 branch. Any cost caused by defective or ill-timed work shall be by the party responsible therefor.
36 Patching of holes, openings, etc. resulting from the work of this branch shall be furnished by this
37 contractor.

- 38 B. See Division 1 for additional requirements.

39 1.14 COMPLETION DATES

- 40 A. This Contractor shall be in a position to meet all completion dates established by the Architect and
41 shall furnish all labor of all classes required to meet such schedules and completion dates.

42 1.15 STANDARDS, CODES AND PERMITS

- 43 A. All work shall be installed in accordance with National, State and Local electrical codes, laws,
44 ordinances and regulations. Comply with all applicable OSHA regulations.

- 1 B. All materials shall have a U.L. label where a U.L. standards and/or test exists.
- 2 C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and
- 3 working drawings required by them.
- 4 D. Secure and pay for all permits and licenses required.

5 1.16 CLEAN-UP

- 6 A. This Contractor shall at all times keep the premises free from excessive accumulation of waste
- 7 material or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he
- 8 shall leave his work broom clean or its equivalent.
- 9 B. In case of dispute, Architect may order the removal of such rubbish and charge the cost to the
- 10 responsible contractor as determined by the Architect. At the time of final clean-up all fixtures and
- 11 equipment shall be thoroughly cleaned and left in proper condition for their intended use.

12 1.17 TESTS

- 13 A. The Contractor shall provide all instrumentation, labor and conduct all tests required by the Architect.
- 14 All tests shall be made before any circuit or item of equipment is permanently energized. Circuits
- 15 shall be phased out and loads shall be distributed as evenly as possible on all phases. All phase
- 16 conductors shall be entirely free from grounds and short circuits. All instrumentation and personnel
- 17 required for testing shall be provided by the Contractor and all tests shall be conducted in the presence
- 18 of the Architect or his authorized representative.

- 19 B. System Tests:

- 20 1. The following tests are required prior to energization of the electrical system:
- 21 a. Secondary feeders shall have an insulation resistance test utilizing a megger applying a
- 22 test potential of 500 volts DC minimum.
- 23 b. Establish secondary phase to ground voltages.
- 24 c. Establish proper phase relationship and motor rotation.
- 25 2. The following tests are required under normal load condition:
- 26 a. Record secondary phase to phase and phase to ground voltages and phase currents at all
- 27 major equipment, apparatus, and on all secondary feeders. Voltage readings shall be
- 28 taken at line side terminals of distribution centers and panelboards.
- 29 b. Confirm proper phase relationship and motor rotation.
- 30 c. Confirm load balance at distribution centers and panels. Rebalance load if necessary
- 31 such that the minimum unbalance between phases shall not exceed 7-1/2%.
- 32 d. Confirm operation of all electrically operated apparatus, such as circuit breakers,
- 33 transfer switches, etc., by exercising same under load.
- 34 e. Record all settings and calibrations of circuit breakers, transfer switches, transformers,
- 35 meters, timing devices, etc.

- 36 C. Records:

- 37 1. All test data obtained by the E.C. or manufacturer/supplier shall be recorded and filed with the
- 38 maintenance manual as part of permanent job records. Test data shall include identification of
- 39 instruments employed (field test only), condition of test (time, date, weather, etc.), parameters
- 40 of test, personnel conducting test, and any pertinent information or conditions noted during the
- 41 test.

42 1.18 SHOP DRAWINGS

- 43 A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment brochure
- 44 depicting:
 - 45 1. Lighting Fixtures
 - 46 2. Panelboards

- 1 3. Occupancy Sensors
- 2 4. Telecommunications Equipment and Cabling
- 3 5. Wiring Devices
- 4 6. Other materials at the request of the Engineer
- 5 B. See Section 01300.
- 6 C. Shop drawings shall bear the Contractor's stamp indicating approval.
- 7 D. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

8 1.19 WORKMANSHIP

- 9 A. The installation of all work shall be made so that its several component parts will function as a
- 10 workable system complete with all accessories necessary for its operation and shall be left with all
- 11 equipment properly adjusted and in working order. The work shall be executed in conformity with
- 12 the best accepted standard practice of the trade so as to contribute to efficiency and appearance. It
- 13 shall also be executed so that the installation will conform and adjust itself to the building structure,
- 14 its equipment and its usage.

15 1.20 DRAWINGS OF OTHER TRADES

- 16 A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the
- 17 parties performing the work of the other trades; their shop drawings, and he shall be governed
- 18 accordingly in laying out his work.
- 19 B. Specifically examine shop drawings to confirm voltage, current characteristics, and other wiring
- 20 requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.

21 1.21 FIELD MEASUREMENTS

- 22 A. The Contractor shall take all field measurements necessary for his work and shall assume the full
- 23 responsibility for their accuracy.

24 1.22 STRUCTURAL INTERFERENCES

- 25 A. Should any structural interferences prevent the installation of the outlets, running of conduits, etc., at
- 26 points shown on drawings, the necessary minor deviation therefrom, as determined by the Architect,
- 27 may be permitted. Minor changes in the position of the outlets or equipment if decided upon before
- 28 any work has been done by the Contractor shall be made without additional charge.

29 1.23 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

- 30 A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of
- 31 the building and site which may affect the execution of his work. No extra payment will be allowed
- 32 for the failure to obtain this information. If in the opinion of the Contractor there are omissions or
- 33 errors in the plans or specifications, the Contractor shall clarify these points with the Architect before
- 34 submitting his bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the
- 35 greater quantity or better quality.

36 1.24 GUARANTEE

- 37 A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding
- 38 lamps, for a period of one year from the date of his final payment. He shall remedy any defects in
- 39 workmanship and repair or replace any faulty equipment which shall appear within the guarantee
- 40 period to the entire satisfaction of the Architect at no additional charge.

41 1.25 TEMPORARY WIRING AND SERVICE

- 42 A. Provide temporary service from existing service. Temporary service shall support construction
- 43 activities.
- 44 B. All contractors shall provide and maintain their own extension cords and additional lamps as required

1 to perform his work properly. Contractors requiring temporary connections to 3 phase power service
2 and single-phase feeders for other than lighting and small fractional horsepower motorized tools shall
3 make arrangement with the Electrical Contractor. Contractors requiring lighting outside of the
4 building shall make their own arrangements with the Electrical Contractor and pay all costs for
5 installation, maintenance and removal. Contractors requiring electrical equipment over one HP,
6 including welders, hoists, heaters and coolers shall make their own arrangements for such service
7 beyond the main switch and shall pay all costs thereof.

8 C. No permanent electrical equipment or wiring shall be used for temporary connections, unless
9 authorized by this Section, upon signed order and with approval by the Architect in behalf of the
10 Owner. Such approvals shall not shorten guarantee period.

11 D. Electrical energy to be paid for by owner.

12 1.26 ELECTRICAL SERVICE

13 A. The service is existing and provides 208Y/120 volts, three phase, four wire.

14 1.27 BRANCH CIRCUIT WIRING

15 A. See plans for general arrangement of circuits, conduit runs, and ratings of branch circuits and special
16 circuits.

17 B. Provide everything necessary to comply with the general scheme shown, including all types of
18 control.

19 C. Circuit numbers as shown on plans are for contractor to plan his wiring and for estimating purposes.
20 These numbers are not necessarily consecutive numbers of the panelboard breakers. Balanced load on
21 bus is to be the determining factor in arrangement of circuits. Balance loading to within 7 1/2%.

22 D. Minimum size of lighting system branch circuit conductors to be #12 AWG.

23 E. Conductors terminating at wired outlets shall extend at least eight (8) inches beyond outlet box
24 conduit fitting.

25 F. 120-volt circuit home runs greater than 50 feet in length shall have #10 AWG minimum size between
26 panel and first receptacle or fixture outlet.

27 G. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All
28 branch circuits will be furnished and installed with an individual accompanying neutral, sized the
29 same as the phase conductors

30 1.28 MOTOR WIRING

31 A. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall be
32 furnished by others.

33 B. Motors shall be set in place by others and the associated motor starters and controllers shall be turned
34 over to this Contractor for erection and line voltage power wiring.

35 C. Any contractor supplying starters and controllers that are not part of this contract shall index same and
36 provide this Contractor with instructions as to proper location in sufficient time to permit the
37 installation of a concealed raceway system.

38 D. Where this Contractor is required to provide control wiring, the Contractor supplying the controllers
39 shall provide all necessary and required wiring diagrams for proper installation.

40 E. Low voltage (less than 115 volts) control wiring shall be by others, unless noted elsewhere in the
41 specifications except that this Contractor shall extend circuit to associated transformers, wire and
42 connect to same.

43 F. This Contractor shall examine the plans and specifications of other sections and shall include in his
44 bid all control wiring, as referenced to be performed by Division 26.

45 G. Required disconnect switches furnished by other sections shall be installed by Division 26.
46 Furthermore, this Contractor shall provide all disconnect switches required by code that are not

1 furnished by other sections.

2 1.29 SPECIAL OUTLETS

- 3 A. General: Furnish and install outlets, wiring and receptacles accordingly, at locations required by
4 equipment serviced or otherwise as directed. Extend wiring to outlets on equipment and make final
5 connection.

6 1.30 IDENTIFICATION

7 A. General:

- 8 1. Materials and equipment installed under this Section shall be clearly identified as listed below.
9 2. Locate identification conspicuously.
10 3. Terminology to be approved by Architect.
11 4. See plans for any additional items to be identified.
12 5. Loads such as motors shall be described by function rather than by the system of arbitrary
13 number as shown on electrical plans.
14 6. Use abbreviations sparingly.

15 B. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely screwed or riveted to the
16 following equipment. Size 1" x 4" with 3/8" high letters; unless space available dictates differently.

- 17 1. Each panelboard, contactor, time switch, starter or disconnect switch. Locate on inside cover
18 of panels.
19 2. Each feeder at all accessible locations.
20 3. Each end of empty conduit runs to indicate the intended use of the conduit and the location of
21 opposite end. Use room numbers that are permanently assigned.

22 C. Typewritten Directory: Each panelboard both new and existing shall be provided with a typewritten
23 directory attached to the inside of panel door and covered with clear plastic indicating load served and
24 rooms served by each protective device in the respective panel. Spares and spaces shall be clearly
25 identified for existing panels, trace existing circuits to confirm use.

26 D. Switch Station:

- 27 1. All key switches shall be engraved indicating controlled item.
28 2. All remote switches shall be engraved indicating controlled item.

29 E. Conductor Identification:

- 30 1. Identify each conductor at each wiring device, connector or splice point with permanently
31 attached wrap-around adhesive markers as manufactured by Brady Co. or 3M.
32 2. This identification shall include branch circuit number, control circuit, or any other appropriate
33 number or lettering that will expedite future tracing and trouble shooting.

34 1.31 LOCATIONS OF OUTLETS AND WIRING DEVICES

35 A. Outlets:

- 36 1. Locations of outlets and electrical equipment on the drawings are approximate only. Unless
37 otherwise indicated on the drawings or established in the specifications, the exact locations of
38 electrical outlets shall be established in the field by directive from the Architect. Generally,
39 outlets shall be located as required for proper installation of equipment served and otherwise
40 locations shall be established by construction or code requirements and such as to be
41 coordinated with equipment of other trades.
42 2. This Section shall consult with the Architect and refer to all details, sections, elevations and
43 equipment plans and the plans of other trades for exact location.
44 3. The Architect reserves the right to make reasonable changes in the location of outlets,
45 apparatus or equipment up to the time of roughing in. Such changes as directed shall be made
46 by the Contractor without additional compensation.
47 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
7 of 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
22 telephone cabling will be using same cabling used for data.
- 23 C. Telephone instruments, switching equipment, wiring, terminal blocks, and other accessories shall be
24 furnished and installed by the Owner (Dane County)
- 25 D. This Contractor shall supply all required conduit, sleeves, and service fittings for the telephone
26 system.
- 27 E. All conduits shall be complete with fish wire by this Contractor, and all telephone outlets shall be fed
28 by 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 SEALING AND FIREPROOFING

- 32 A. Sealing and fireproofing of openings between conduit, cable tray, wireway, trough, cablebus, busduct,
33 etc. and fire rated surfaces shall be the responsibility of the contractor whose work penetrates the
34 opening.
- 35 B. Sealing and fireproofing shall use materials and methods complying with ASTM E814 requirements
36 appropriate to the rating of the material penetrated.
- 37 C. Materials by Dow-Corning, 3M, Specified Technologies, Inc., and Chase-Foam are acceptable if in
38 accordance with (B) above.
- 39 D. Submit manufacturer's penetration details to authority having jurisdiction. Details shall confirm
40 method's compliance with ASTM E814.
- 41 E. Include copies of penetration details in Project Operation and Maintenance Manuals.

42 1.34 ALTERNATE BIDS

- 43 A. See Section 01030 for descriptions of alternates required.
- 44

1 1.35 DEMOLITION, RENOVATION AND DISPOSITION OF EXISTING EQUIPMENT

- 2 A. This contractor shall note that the existing building will remain in service during portions of the
3 construction period. Areas of the building will be vacated as required to facilitate construction.
- 4 B. This Contractor shall proceed with the completion of his work in such a manner as to cause the least
5 possible interference with the Owner's operation. All work required in the existing building shall be
6 done in a manner and time acceptable to the Owner. Outages and other work rendering existing
7 equipment inoperative shall be held to a minimum, prior arrangements for each shall be made with the
8 Owner and shall be acceptable as to time and duration.
- 9 C. Electrical equipment in conflict with construction shall be removed and/or relocated as indicated on
10 the drawings, as directed or required. This Contractor shall remove all electrical equipment released
11 from service because of construction, and no equipment removed shall be reused, except as
12 specifically directed on the drawings or elsewhere herein. Except for conduit, conductor and
13 miscellaneous hardware, all electrical equipment shall remain the property of the Owner and shall be
14 stored on the site for removal by the Owner. All other equipment removed shall become the property
15 of this Contractor and shall be removed from the site.
- 16 D. This Contractor shall be responsible for the work of other trades as may be necessary to facilitate the
17 installation of electrical work in the existing building. Such work necessary that is normally done by
18 other trades and is not covered as a part of other Divisions of the work shall be done under the
19 direction and at the expense of the Electrical Contractor. This work shall include but is not limited to,
20 cutting, patching and refinishing and all work necessary and required to leave existing building in
21 condition acceptable to the Architect.
- 22 E. Any existing circuits or equipment not shown on the drawings and which are logically expected to be
23 continued in service and which may be interrupted or disturbed during construction shall be
24 reconnected in an approved manner. In addition, any existing circuit or equipment, which may
25 require relocation or rerouting, because of construction, shall be considered a part of the work of this
26 branch and shall be done by this Contractor with no additional compensation.
- 27 F. All coring that is required for electrical work shall be by this Contractor.
- 28 G. All new conduit and wiring shall be concealed.
- 29 H. All ballasts, lamps, transformers, or other equipment containing hazardous materials removed during
30 the project become the Contractor's property and he shall dispose of them in accordance with
31 applicable DNR and EPA regulations.

32
33 END OF SECTION 26 05 00

SECTION 26 09 23

OCCUPANCY SENSOR LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

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

1.02 GENERAL PROVISIONS

- A. In general, the work includes:
 - 1. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
 - 2. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.
 - 3. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.

1.03 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years.
- B. All components shall be UL listed, offer a five (5) year warranty and meet all state and local applicable codes requirements.

1.04 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor-based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's 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.
- B. Submit a lighting plan clearly marked by manufacturer showing proper product, location, and orientation of each sensor.
- C. Submit any interconnection diagrams per major sub-system showing proper wiring.
- D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

1 1.06 SYSTEM OPERATION

- 2 A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction
3 with the occupancy system.

4 PART 2 - PRODUCTS

5 2.01 ACCEPTABLE MANUFACTURERS

- 6 A. The Watt Stopper, Inc.
7 B. Or Equivalent Devices by the Following Manufacturers
8 1. Hubbell
9 2. Leviton
10 3. Sensor Switch

11 2.02 SYSTEM OPERATION

- 12 A. All products shall be Watt Stopper product numbers:
13 1. Ceiling Sensors: W-500A, W-1000A, W-2000A, W-2000H, W-PIR, DT-100L, CI-100, CI-
14 200.
15 2. Wall Sensors: WI-120A, WI-277A, WS-120, WS-277, WM-120, WM-277.
16 3. Power and Slave Packs: A-120E, A-277E, S-120/277.
17 4. Low Temperature: CB-100, CB-200.
18 B. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet,
19 and gross motion up to 1,000 square feet.
20 C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277
21 volts and shall have 180 degree coverage capability.
22 D. Bi-level wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000
23 watts to 277 volts.
24 E. Passive Infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier
25 configuration, with grooves-in to eliminate dust and residue build-up.
26 F. Passive Infrared and Dual Technology sensors shall have fully automatic operation, offer daylighting
27 foot-candle adjustment control and be able to accommodate dual level lighting.
28 G. All sensors shall be capable of operating normally with electronic ballast, PL lamp systems, and rated
29 motor loads.
30 H. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic
31 reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
32 I. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity.
33 Controls shall be recessed to limit tampering.
34 J. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is
35 utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is
36 replaced. This control shall be recessed to prevent tampering.
37 K. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance
38 to assure reliable performance and eliminate sensor cross talk. Sensors using multiple frequencies are
39 not acceptable.
40 L. All sensors shall provide a method of indication to verify that motion is being detected during testing
41 and that the unit is working.
42

- 1 M. Where specified, sensor shall have an internal additional isolated relay with Normally Open,
2 Normally Closed, and Common outputs for use with HVAC control, Data Logging, and other control
3 options. Sensors utilizing separate components to achieve this function are not acceptable.
- 4 N. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes
5 and shall have voltage drop protection.
- 6 O. The Contractor shall certify in writing that installed sensors comply with the specified California
7 Energy Commission criteria for ultrasonic sound.
- 8 P. All sensors shall have UL rated, 94V-0 plastic enclosures.

9 2.03 CIRCUIT CONTROL HARDWARE - CU

- 10 A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to
11 mount on external J boxes and be integrated self-contained unit consisting internally of load switching
12 control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors.
- 13 B. Relay Contacts shall have ratings of:
14 1. 13A - 120 VAC Tungsten
15 2. 20A - 120 VAC Ballast
16 3. 20A - 277 VAC Ballast

17 2.04 CONTROL WIRING

- 18 A. Control wiring between sensors and controls units shall be Class II, 18-24 AWG stranded U.L.
19 Classified, PVC insulated, or Teflon jacketed cable approved for use in plenums, where applicable.

20 PART 3 - EXECUTION

21 3.01 INSTALLATION

- 22 A. It shall be the contractor's responsibility with the supplier's assistance to locate and aim sensory in the
23 correct location required for complete and proper volumetric coverage within the range of coverage(s)
24 of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to
25 completely cover the controlled area to accommodate all occupancy habits of single or multiple
26 occupants at any location within in the room(s). The locations and quantities of sensors shown on the
27 drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The
28 contractor shall provide additional sensors if required to properly and completely cover the respective
29 room.
- 30 B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's
31 factory authorized representative, at the owner's facility, to verify placement of sensors and
32 installation criteria.
- 33 C. Proper judgement must be exercised in executing the installation in the available space and to
34 overcome local difficulties due to space limitations or interference of structural components. The
35 contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's
36 personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy
37 sensing devices and systems, or;

38 END OF SECTION 26 09 23

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SECTION 26 20 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One 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 Section 01340.
- E. Operation and Maintenance (O&M) Data:
 - 1. Maintenance data for materials and products for inclusion in Operating and Maintenance specified in Section 01730.
 - 2. Submit in accordance with Section 01340 and 01730.
- F. Test Results:
 - 1. Report of field tests and observations certified by Contractor.

1.04 QUALITY ASSURANCE

- A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 - 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
 - 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.
- B. Regulatory Requirements:
 - 1. National Electrical Code: Components and installation shall comply with NFPA 70.
 - 2. Local codes and ordinances.

1 PART 2 - PRODUCTS

2 2.01 ELECTRICAL METALLIC TUBING (EMT)
3 INTERMEDIATE METALLIC CONDUIT (IMC)
4 GALVANIZED RIGID STEEL CONDUITS (GRS)

5 A. Manufacturers:

- 6 1. Allied Steel
- 7 2. Omega
- 8 3. Wheatland
- 9 4. Columbia

10 B. Manufacturer's standard lengths and size.

11 C. Protected inside and out by hot-dipped galvanized or electrogalvanized coating.

12 D. Minimum size: 1/2 inch.

13 E. Do not use aluminum conduit.

14 2.02 PLASTIC CONDUIT (PVC)

15 A. Manufacturers:

- 16 1. Carlon.
- 17 2. Genova.
- 18 3. Certainteed.

19 B. Standard lengths and sizes.

20 C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC2 standards,
21 UL listed, and as required by NEC.

22 D. Rated for 90 degrees C cable.

23 E. Minimum size: 2" inches.

24 2.03 FLEXIBLE CONDUIT

25 A. Manufacturers:

- 26 1. Triangle PWC, Inc.
- 27 2. Anaconda
- 28 3. Flexsteel
- 29 4. American Flexible Conduit

30 B. Galvanized flexible steel.

31 C. Standard conduit sizes.

32 D. Minimum Size: 1/2 inch.

33 2.04 LIQUIDTIGHT FLEXIBLE CONDUIT

34 A. Manufacturers:

- 35 1. O-Z/Gedney Company
- 36 2. American Flexible Conduit
- 37 3. Flex-Guard, Inc.
- 38 4. Liquatite
- 39 5. Anaconda

40 B. Galvanized flexible steel.

- 1 C. Standard conduit sizes.
- 2 D. Minimum Size: 1/2 inch.
- 3 E. Heavy wall PVC jacket.
- 4 2.05 FITTINGS
- 5 A. Manufacturers:
 - 6 1. Appleton Electric Company.
 - 7 2. Steel City, American Electric.
 - 8 3. Oz-Gedney Co.
- 9 B. Steel or malleable iron, zinc galvanized, or cadmium plated.
- 10 C. Do not use indentor type fittings. Set screw fittings are acceptable.
- 11 D. Do not use aluminum or die cast fitting.
- 12 E. EMT IMC and GRS Connectors and Couplings:
 - 13 1. Threaded.
 - 14 2. Insulated throat.
 - 15 3. Rain and concrete type.
- 16 F. Flexible Conduit Connectors and Couplings:
 - 17 1. Threaded.
 - 18 2. Insulated throat.
 - 19 3. Grounding type.
- 20 G. Liquidtight Flexible Conduit Fittings:
 - 21 1. Liquidtight.
 - 22 2. Insulated throat.
 - 23 3. Threaded.
 - 24 4. Grounding type.
- 25 H. Expansion Joints:
 - 26 1. Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
 - 27 2. Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.
- 28 I. Seals:
 - 29 1. Wall entrance, Appleton Type FSK or FSC.
- 30 J. Drain Fittings:
 - 31 1. Automatic Drain Breather:
 - 32 a. Explosionproof.
 - 33 i. Safe for Class I, Groups C and D.
 - 34 b. Capable of passing minimum 25 cc water/minimum and minimum 0.05 cubic foot
 - 35 air/minimum at atmospheric pressure.
 - 36 2. Condensate Drain:
 - 37 a. Conduit outlet body, Type T.
 - 38 b. Threaded, galvanized plug with 3/16 inch drilled holed through plug.
- 39 2.06 WIRES, CABLES, AND CONNECTORS
- 40 A. Manufacturers:
 - 41 1. Wire and Cable:
 - 42 a. Continental

- 1 b. Southwire.
- 2 c. Rome Cable.
- 3 d. Houston Wire and Cable.
- 4 e. Beldon.
- 5 f. Dekoron.
- 6 g. Royal
- 7 h. South
- 8 i. General
- 9 2. Connectors:
- 10 a. Burndy.
- 11 b. Thomas and Betts.
- 12 c. Blackburn, American Electric.
- 13 3. Electrical Tape:
- 14 a. 3M Scotch Brand.
- 15 b. Plymouth.
- 16 c. or equal.
- 17 B. Copper wire only.
- 18 C. 600 v insulation (ASTM standard compounds) and color code conductors for low voltage (secondary
- 19 feeders and branch circuits) as required by NEC.
- 20 1. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for branch circuit and
- 21 feeder conductors size No. 8 AWG and smaller.
- 22 2. Type XHHW-2 Stranded: Single conductor for branch circuits, feeders and service conductors
- 23 larger than No. 8 AWG.
- 24 3. Provide grounding conductor with same insulation as circuit conductors when run with circuit
- 25 conductors.
- 26 4. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for 120 v control wiring
- 27 and No. 14 AWG minimum for graphic indication, no shielded instrumentation and other
- 28 control wiring operating at less than 120 v unless otherwise noted on Drawings.
- 29 a. Provide high density polyethylene jacketed multi-wire cable assemblies in underground
- 30 conduit or duct.
- 31 D. Joints, Taps, and Splices:
- 32 1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed compression
- 33 spring-type solderless connectors with plastic cover.
- 34 2. Joints, Taps, and Splices in Conductors No. 8 AWG and Larger: Solderless two or four-bolt
- 35 compression type connectors of type that will not loosen under vibration or normal strains.
- 36 3. Terminations: Compression-type crimp lugs.
- 37 2.07 BOXES
- 38 A. Manufacturer:
- 39 1. Interior Outlet Boxes:
- 40 a. Appleton Electric Company.
- 41 b. Raco
- 42 c. Steel City, American Electric.
- 43 2. Weatherproof Outlet Boxes:
- 44 a. Appleton Electric Company.
- 45 b. Crouse-Hinds Company.
- 46

- 1 c. O-Z/Gedney company.
- 2 d. Perfect-Line, American Electric.
- 3 3. Junction and Pull Boxes:
- 4 a. Hoffman Engineering Company.
- 5 b. Keystone Columbia, Inc.
- 6 c. Electromate.
- 7 B. Outlet Boxes - Flush Mounted:
- 8 1. Wall Outlets: Square corner, galvanized masonry type with internally mounted ears or 4-
- 9 inches square with raised cover having square corners and internally mounted ears.
- 10 2. Ceiling Lighting Fixture Outlet Boxes: 4-inch square galvanized box with raised cover set
- 11 flush with finished surface, complete with 3/8-inch fixture stud.
- 12 C. Outlet Boxes - Surface Mounted:
- 13 1. General Use: 4-inches square with raised device cover.
- 14 2. Weatherproof: Cast galvanized with threaded hub.
- 15 3. Safety outlet enclosure - Tay Mac Co. - Verify outlet configuration.
- 16 4. Hazardous Locations: Cast galvanized approved for classification of area.
- 17 D. Junction and Pull Boxes:
- 18 1. Fabricate from code gauge galvanized steel, with covers held in-place by corrosion resistant
- 19 machine screws.
- 20 2. Size as required by code for number of conduits and conductors entering and leaving box.
- 21 3. Provide with welded seams where applicable, and equipment with corrosion resistant nuts,
- 22 bolts, screws, and washers.
- 23 4. Finish with rust inhibiting primer.
- 24 2.08 FIRE RATED THROUGH FLOOR FITTINGS
- 25 A. None required.
- 26 2.09 WIRING DEVICES
- 27 A. Manufacturers:
- 28 1. Hubbell Wiring Device Division.
- 29 2. Pass and Seymour, Inc.
- 30 3. Leviton
- 31 4. Cooper Wiring Devices
- 32 B. Fabricated Devices:
- 33 1. Factory-fabricated, specification grade wiring devices in type, color, and electrical rating for
- 34 service indicated. Ivory color or as selected by ENGINEER OR OWNER.
- 35 2. Wiring devices of one manufacturer.
- 36 3. See Drawing symbol schedule for identification of device type.
- 37 C. Switches:
- 38 1. General Use Lighting Switches: 20-amp toggle, equal to Hubbell No. 1221-I series.
- 39 2. Switches controlling equipment, operation of which is not evident from switch position, shall
- 40 include flush neon pilot light in conjunction with proper switch. Each switch shall be complete
- 41 with engraved plate to identify equipment being controlled (white letters on black, 1/8-inch-
- 42 high minimum).
- 43

- 1 D. Receptacles:
- 2 1. General use duplex receptacles: NEMA No. 5-20R, grounding type, 20-amp Hubbell No.
- 3 5362 Specification Grade.
- 4 2. Special purpose receptacles as shown on Drawings and schedules.
- 5 3. GFI receptacles shall be Hubbell GFR5352IA
- 6 E. Wiring Device Plates and Covers:
- 7 1. Wall plates for wiring devices with ganging and cut-outs as indicated, provided with metal
- 8 screws for securing plates to devices, screw heads colored to match finish of plate.
- 9 2. Plates for Flush Mounted Devices: Equal to Sierra P line specifications grade Type No. 430
- 10 brushed stainless steel.
- 11 3. Telephone outlet configuration to match telephone outlet jack or cable.
- 12 4. Device plates for surface mounted Type FS or FD boxes to be Type FSK galvanized steel.
- 13 5. Device plates for surface mounted, 4-inch square bossed to be ½ inch raised galvanized steel
- 14 covers.
- 15 6. Weatherproof outlet enclosure for exterior devices or devices in damp locations to be marked
- 16 galvanized gray cast malleable with gasketed lift cover plate as shown on Drawings. Suitable
- 17 for wet locations while in use. Enclosure must be gasketed. Provide Intermatic WP1010MC,
- 18 WP1010HMC, or WP1030MC with appropriate mounting base(s) and inserts.
- 19 2.10 MOTOR STARTERS
- 20 A. None required.
- 21 2.11 MOTOR AND CIRCUIT DISCONNECTS
- 22 A. Manufacturers:
- 23 1. Eaton/Cutler-Hammer
- 24 2. Square D
- 25 3. General Electric
- 26 B. Enclosed Circuit Breaker Construction:
- 27 1. Dual cover interlock.
- 28 2. External trip indication.
- 29 3. Provisions for control circuit interlock.
- 30 4. Padlock provisions for padlock in Off position.
- 31 5. Handle attached to box, not cover.
- 32 6. Handle position indicates On, Off or Tripped.
- 33 7. Provisions for insulated or groundable neutral.
- 34 C. Safety Switches:
- 35 1. NEMA heavy duty Type HD.
- 36 2. Dual cover interlock.
- 37 3. Visible blades.
- 38 4. Provisions for control circuit interlock.
- 39 5. Pin type hinges.
- 40 6. Tin plated current carrying parts.
- 41 7. Quick make and break operator mechanism.
- 42 8. Handle attached to box, not cover.
- 43 9. Handle position indication, On in up position and Off in down position.
- 44 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. 600v 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 2.13 PANELBOARDS

- 31 A. Manufacturers:
- 32 1. Eaton-Cutler-Hammer
- 33 2. Square D
- 34 3. General Electric
- 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.
- 40 C. Panelboard Construction:
- 41 1. Main breaker or main lugs only, per panelboard schedule.
- 42 2. Molded case circuit breakers.
- 43 3. Terminals:
- 44 a. UL listed for type or wire specified.

- 1 b. Anti-turn solderless compression type.
- 2 4. Bussing:
- 3 a. Distributed phase sequence type.
- 4 b. 225 amps, 98% conductivity hard drawn copper or as shown on panelboard schedule or
- 5 Drawings.
- 6 c. Copper.
- 7 d. Mounting hardware behind usable space.
- 8 5. Gutters adequate for wire size used, 4-inch minimum.
- 9 6. Boxes:
- 10 a. Code gauge galvanized steel.
- 11 b. Without knockouts.
- 12 7. Fronts:
- 13 a. Panel front cover shall have piano hinge to allow access to wiring gutters without
- 14 removal of panel trim. Hinged trim held in place with screw fasteners. Door shall be
- 15 built into trim, which allows access to breakers as well as to hinged trim screw
- 16 fasteners. Breaker access door shall have the following features:
- 17 i. Concealed piano hinge.
- 18 ii. Flush stainless-steel cylinder tumbler type locks with spring loaded door pulls.
- 19 iii. Locks keyed alike.
- 20 iv. Rust inhibiting primer, baked enamel finish.
- 21 v. Dead front safety type.
- 22 vi. Concealed hinges and trim clamps.
- 23 b. Circuit Directory:
- 24 i. Suitable for complete descriptions.
- 25 ii. Clear plastic cover.
- 26 8. Typewritten card inside panel door.
- 27 9. Special features as shown on Drawings.
- 28 10. Code gauge steel.
- 29 11. Engraved laminated nameplate in accordance with Section 26 05 00.

30 2.14 **MOLDED CASE CIRCUIT BREAKERS**

- 31 A. Manufacturers:
- 32 1. Eaton to match existing panels.

33 2.15 **GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLES (GFCI)**

- 34 A. Ratings:
- 35 1. 120 vac.
- 36 2. 20 amp.
- 37 B. Tripping Requirement:
- 38 1. UL Class A.
- 39 C. Construction:
- 40 1. Shallow depth.
- 41 2. Line and load terminal screws.
- 42 3. Noise suppression.
- 43 4. Feed through.
- 44 5. Standard duplex wall plates shall fit.

- 1 6. NEMA 5-20R configuration.
- 2 D. Meet requirements of UL 943 ground-fault circuit interrupters.
- 3 2.16 GROUNDING AND BONDING
- 4 A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes,
5 ratings, and quantities indicated are in excess of NEC requirements, more stringent requirements and
6 greater size, rating, and quantity indications govern.
- 7 B. Conductor Materials: Copper.
- 8 C. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including
9 stranding.
- 10 D. Equipment Grounding Conductor: Green insulated.
- 11 E. Grounding Electrode Conductor: Stranded cable.
- 12 F. Bare Copper Conductors:
- 13 1. Solid Conductors: ASTM B3.
- 14 2. Assembly of Stranded Conductors: ASTM B8.
- 15 3. Tinned Conductors: ASTM B33.
- 16 G. Ground Bus: Bar annealed copper bars of rectangular cross section.
- 17 H. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bar copper wire, terminated with copper
18 ferules.
- 19 I. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except as
20 indicated.
- 21 J. Connector Products
- 22 1. General: Listed and labeled as grounding connectors for materials used.
- 23 2. Pressure Connectors: High-conductivity-plated units.
- 24 3. Bolted Clamps: Heavy-duty units listed for application.
- 25 4. Exothermic Welded Connections: Provide in kit form and select for specific types, sizes, and
26 combinations of conductors and other items to be connected.

27 PART 3 - EXECUTION

28 3.01 GENERAL

- 29 A. Install products in accordance with NEC, manufacturer's instructions, applicable standards, and
30 recognized industry practices to ensure products serve intended function.

31 3.02 CONDUITS AND CONDUIT FITTINGS

- 32 A. Complete conduit installation prior to installing cables.
- 33 B. Unless specifically indicated otherwise on Drawings, use rigid galvanized steel conduit for general
34 wiring.
- 35 C. Provide watertight conduit system where installed in wet places, underground or where buried in
36 masonry or concrete.
- 37 D. EMT conduit may be used for conduit sizes up to 4 inches.
- 38 E. Conduit shall be run concealed except exposed surface conduit may be installed where noted on
39 Drawings or where concealment found to be impractical or impossible, and only with approval of
40 ENGINEER.
- 41 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
6 times conduit trade diameter with minimum 2-inch concrete covering. Conduits over 1 inch may not
7 be 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
11 of 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
17 subject to moisture, dirt, fumes, oil, corrosive atmosphere, exposed or concealed, with
18 connectors to ensure liquid tight, permanently grounded connection. Locate where least
19 subject to physical 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
28 mounted above ceiling and accessible from below ceiling to recessed ceiling mounted equipment.
29 Allow for positioning of equipment to tile increments.
- 30 S. Negotiate beams and changes in ceiling heights with LB conduit fittings on outside corners and ells
31 on inside corners. Arrange bends and offsets in parallel conduits to present neat symmetrical
32 appearance.
- 33 T. In precast areas, run conduits in insulation space or in floor topping without crossing conduits, using
34 3/4 in. maximum conduit size.
- 35 U. Core drill through reinforced concrete with approval of ENGINEER.
- 36 V. Split, crushed or scarred conduit not acceptable.
- 37 W. Do not route over boiler, incinerator or other high temperature equipment.
- 38 X. Flexible metal conduit can only be used for final connections to motors, transformers, or to light
39 fixtures above suspended ceilings.

40 3.03 SURFACE METAL RACEWAY

- 41 A. Mount to surface with No. 8 flathead fasteners or approved support clips.
- 42 B. Do not pinch wires.
- 43 C. Remove metal burrs and sharp edges.

- 1 D. Provide bushing.
- 2 E. Install in accordance with manufacturer's recommendations.
- 3 F. Provide covers where two lengths come together.

4 3.04 WIRE AND CABLE

- 5 A. Run wire and cable in conduit unless otherwise indicated on Drawings.
- 6 B. On branch circuits, use standard colors.
- 7 C. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with 2 half-lap layers of
- 8 vinyl plastic electrical tape and finish wrap of color coding tape, where required by code.
- 9 D. Run ground wire with power circuits; conduit shall not be grounding path.
- 10 E. Color Coding: Conductors for lighting and power wiring as indicated below.

11	<u>Phase</u>	<u>208/120v</u>	<u>480/277v</u>
12	A	Black	Brown
13	B	Red	Orange
14	C	Blue	Yellow
15	Neutral	White	Gray
16	Ground	Green	Green

17 3.05 BOXES

- 18 A. Install knockout closures to cap unused knockout holes where blanks have been removed.
- 19 B. Locate boxes to ensure accessibility of electrical wiring.
- 20 C. Secure boxes rigidly to subsurface upon which being mounted or solidly embed boxes in concrete or
- 21 masonry. Do not support from conduit.
- 22 D. Do not burn holes, use knockout punches or saw.
- 23 E. Provide outlet box accessories as required for each installation such as mounting brackets, fixture
- 24 study, cable clamps, and metal straps for supporting outlet boxes compatible with outlet boxes being
- 25 used and meeting requirements of individual wiring situations.
- 26 F. Location of outlets and equipment shown on Drawings is approximate. Verify exact location.
- 27 G. Minor modification in location of outlets and equipment is considered incidental up to distance of 10
- 28 feet with no additional compensation, provided notification of modification is given prior to roughing
- 29 in of outlet.
- 30 H. Flush outlets shall have edges or plaster flush with finished wall or ceiling surfaces so plates can be
- 31 drawn tightly to wall or ceiling surfaces.
- 32 I. Mounting heights:
- 33 1. Shall conform to ADA guidelines.
- 34 2. In general, unless otherwise shown on Drawings:
- 35 a. Switches: 48 inches above floor to top of box.
- 36 b. AC Receptacles and Telephone Outlets: 15 inches above floor to bottom of box or 6
- 37 inches above counters, counter backsplashes in finished areas; 48 inches to top of box
- 38 above floor in unfinished areas.
- 39 c. Wall Bracket Lighting Fixtures: 8 inches above mirrors or 6 feet-6 inches above floor.
- 40 d. Pushbuttons: 48 inches above floor to top of box.
- 41 e. Motor Starters and Disconnect Switches: 60 inches above floor.
- 42 i. Thermostats: 48 inches above floor.
- 43 f. Bells and Horns: 8 feet-0 inches above floor.
- 44 g. Clocks: 8 ft.-0 inches above floor.

- 1 h. Fire Alarm visual signals 80" above floor.
- 2 i. Emergency Battery Units: 8 ft. - 0 inches above floor or 12" below ceiling.
- 3 J. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall,
4 minimum 12 inches.
- 5 K. Where emergency switches occur adjacent to normal light switches, install in separate boxes in
6 accordance with NEC and device plate color coding separation.
- 7 L. Light Fixture Outlet Boxes:
 - 8 1. Securely mount with approved type bar hangers spanning structural members to support
9 weight of fixture.
 - 10 2. Do not support from conduit.
 - 11 3. Equip with 3/8-inches fixture stud and tapped fixture ears.

12 3.06 FIRE RATED THROUGH FLOOR FITTINGS

- 13 A. None required.

14 3.07 WIRING DEVICES

- 15 A. Do not install devices until wiring is complete.
- 16 B. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or
17 otherwise. Make circuit connections by using wire connectors and pigtails.
- 18 C. Install gasket plates for devices or system components having light emitting features such as switch
19 with pilot light and dome lights. Where installed on rough textured surfaces, seal with black self-
20 adhesive polyfoam.
- 21 D. Ground receptacles with insulated green ground wire from device ground screw to bolted outlet box
22 connection or as shown on Drawings.
- 23 E. Wrap wiring devices with insulating tape.
- 24 F. Install emergency switches which occur adjacent to normal light switches in separate boxes to
25 maintain systems isolation in accordance with NEC.

26 3.08 OVERCURRENT PROTECTIVE DEVICES.

- 27 A. Install fuses just prior to energizing equipment.
- 28 B. Locate circuit breakers as shown on Drawings.
- 29 C. Install GFCI receptacles as required by NEC.

30 3.09 PANELBOARDS

- 31 A. Flush or surface mount as specified on Drawings and schedules.
- 32 B. Support panel cabinets independently to structure with no weight bearing on conduits.
- 33 C. Install recessed Panelboards to allow cover to be drawn tight against wall to provide neat appearance.
- 34 D. Install panelboards so top breaker is not higher than 6 feet-0 inches above floor.
- 35 E. Adjacent panel cabinets shall be same size and mounted in horizontal alignment.
- 36 F. Install typewritten directory in each panelboard, accurately indicating rooms or equipment being
37 served after final circuit changes have been made to balance circuit loads.
- 38 G. Install four spare 1-inch conduits from top of each flush mounted panelboard to area above ceiling for
39 future use. On flush mounted panelboards located on first and higher-level floors, provide two spare
40 1-inch conduits from bottom of panelboard to ceiling area of floor below for future use.

41 3.10 GROUNDING AND BONDING

- 1 A. Application
2 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and
3 quantities of equipment grounding conductors, except where larger sizes or more conductors
4 are indicated.
5 a. Install separate insulated equipment grounding conductors with circuit conductors.
6 Raceway may be used as equipment ground conductor where feasible in non-hazardous
7 areas and permitted by NEC for lighting circuits. Install insulated equipment ground
8 conductor in nonmetallic raceways unless designated for telephone or data cables.
9
10 B. Installation
11 1. General: Ground electrical systems and equipment in accordance with NEC requirements
except where Drawings or Specifications exceed NEC requirements.

12 3.11 FIELD QUALITY CONTROL

- 13 A. Control Circuits, Branch Circuits, Feeders, Motor Circuits, and transformers:
14 1. Megger check to phase-to-phase and phase-to-ground insulation levels.
15 a. Do not megger check solid state equipment.
16 2. Continuity.
17 3. Short circuit.
18 4. Operational check.
19 B. Wiring Devices:
20 1. Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity, proper
21 ground connection, and wiring faults.

22 3.12 ADJUSTMENT AND CLEANING

- 23 A. Circuit Breakers:
24 1. Adjustable settings shall be set to provide selective coordination, proper operation, and
25 compliance with NEC.
26 B. Restore damaged areas on PVC jacketed rigid conduit with spray type touch-up coating compound or
27 as directed by manufacturer.
28 C. Pull cleaning pull through conduits to clear of dirt, oil, and moisture.

29 END OF SECTION 26 20 00

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SECTION 26 51 13

LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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 E. RoHS - Restriction of Hazardous Substances. Council of the European Union (EC) Directive
2 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic
3 equipment.
- 4 F. LM-79-08 (or latest) - IES Approved Method for the Electrical and Photometric Measurements of
5 Solid-State Lighting Products.
- 6 G. LM-80-08 (or latest) - IES Approved Method for Measuring Lumen Maintenance of LED Light
7 Sources.
- 8 H. TM-21-11 (or latest) - IES Technical Memorandum on Projecting Long Term Lumen Maintenance of
9 LED Light Sources.
- 10 I. NEMA SSL 1-2010 (or latest) - Electronic Drivers for LED Devices, Arrays, or Systems.
- 11 1.04 DEFINITIONS
- 12 A. Emergency Lighting Unit: Fixture with integral emergency battery power supply and means for
13 controlling and charging battery. Also known as emergency light set. Emergency units are available
14 with integral lamps only.
- 15 B. Fixture: Complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and
16 parts required to distribute light, position and protect lamps, and connect lamps to power supply.
17 Internal battery powered exit signs and emergency lighting units also include battery and means for
18 controlling and recharging battery. Emergency lighting units are available with and without integral
19 lamp heads and lamps.
- 20 C. Luminaire: Fixture.
- 21 D. Average Life: Time after which 50% will have failed and 50% will have survived under normal
22 conditions.
- 23 1.05 SUBMITTALS
- 24 A. Product Data:
- 25 1. Describe fixtures, lamps, ballasts, poles, emergency lighting units, and accessories. Arrange
26 product data for fixtures in order of fixture designation. Include data on features and accessories
27 and following information:
- 28 a. Outline drawings of fixtures indicating dimensions and principal features.
- 29 b. Electrical ratings and photometric data with specified lamps and certified results of
30 independent laboratory tests.
- 31 c. Data on batteries and chargers of emergency lighting units.
- 32 B. Shop Drawings: Detail nonstandard fixtures and indicating dimensions, weights, methods of field
33 assembly, components, features, and accessories.
- 34 C. Samples: Submit sample of fixture if different than specified.
- 35 D. Miscellaneous:
- 36 1. For substitutes only, product certifications signed by manufacturers of lighting fixtures
37 certifying that their fixtures comply with specified requirements.
- 38 2. Warranty for rechargeable battery.
- 39 3. Coordination drawings for fixtures that require coordination with other equipment installed in
40 same space.
- 41 E. Submit in accordance with Division 1.
- 42

- 1 1.06 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 Electric Code, Article 100.
- 6 B. Regulatory Requirements:
- 7 1. National Electric Code: Components and installation shall comply with NFPA 70.
- 8 2. Comply with ANSI C2, "National Electrical Safety Code".
- 9 C. Coordinate fixtures mounting hardware and trim with ceiling tile.
- 10 1.07 WARRANTY
- 11 A. Requirements:
- 12 1. Special Project Warranty Period (Where called for herein.): 10 years, beginning on date of
- 13 Substantial Completion. Full warranty shall apply for first year of period, and prorata
- 14 warranty for last 9 years.
- 15 2. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to
- 16 weathering.
- 17 3. Color Retention: Warranty against fading, staining, chalking due to effects of weather and
- 18 solar radiation.

19 PART 2 - PRODUCTS

- 20 2.01 FIXTURES, GENERAL
- 21 A. Comply with requirements specified in Articles below and lighting fixture schedule.
- 22 2.02 FIXTURE COMPONENTS, GENERAL
- 23 A. Metal Parts: Free from burrs, sharp corners, and edges.
- 24 B. Sheet Metal Components: Steel, except as indicated. Form and support components to prevent
- 25 warping and sagging.
- 26 C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under
- 27 operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames,
- 28 lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured
- 29 in operating position.
- 30 D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
- 31 1. White surfaces: 85%.
- 32 2. Specular Surfaces: 83%.
- 33 3. Diffusing Specular Surfaces: 75%.
- 34 4. Laminated Silver Metallized Film: 90%.
- 35 E. Exterior Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or
- 36 deform in use. Provide filter/breather for enclosed fixtures.
- 37 F. Exterior Exposed Hardware Material: Stainless steel.
- 38

- 1 G. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal
2 glass except as indicated.
- 3 1. Plastic: Highly resistant to yellowing and other changes due to aging, exposure to heat and
4 UV radiation.
- 5 2. Lens Thickness: 0.125 inches, minimum.
- 6 H. Photoelectric Relay: UL 773.
- 7 1. Contact Relays: Single-throw, arranged to fail in the "on" position and factory set to turn light
8 unit on at 1.5 to 3 foot-candles and off at 4.5 to 10 foot-candles with 15 seconds minimum
9 time delay.
- 10 2. Relay Mounting: In fixture housing.

11 2.03 SUSPENDED FIXTURE SUPPORT COMPONENTS

- 12 A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as
13 fixture.
- 14 B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount single fixture.
15 Finish same as fixture.
- 16 C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
- 17 D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded
18 attachment, cord, and locking-type plug.

19 2.04 LED Luminaires

- 20 A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification
21 Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's®
22 Qualified Products List, but they must meet the Product Qualification Criteria. The technical
23 requirements that the luminaire shall meet for each Application Category are:
- 24 1. Minimum Light Output.
- 25 2. Zonal Lumen Requirements.
- 26 3. Minimum Luminaire Efficacy.
- 27 4. Minimum CRI.
- 28 5. L70 Lumen Maintenance.
- 29 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED
30 components.

31 *Additional requirements:*

- 33 B. Color Temperature of 3000K-5000K for interior fixtures as listed in the Light Fixture Schedule on the
34 plans. The color temperature of exterior LED fixtures should not exceed 4100K (nominal).
- 35 C. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process
36 to achieve consistent fixture-to-fixture color for interior fixtures. Exterior fixtures shall use a maximum
37 5-step MacAdam Ellipse binning process.
- 38 D. Glare Control: Exterior fixtures shall meet DesignLights Consortium's® criteria for Zonal Lumen
39 Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior fixtures.
- 40 E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- 41 F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- 42 G. Light output of the LED system shall be measured using the absolute photometry method following
43 IES LM-79 and IES LM-80 requirements and guidelines.
- 44 H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- 45 I. Driver shall have a rated life of 50,000 hours, minimum.

- 1 J. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- 2 K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- 3 L. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior fixtures, and a
4 minimum of 70 for exterior fixtures.
- 5 M. LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the
6 LED for the ambient temperature of the location the fixture is to be installed. Rated case temperature
7 shall be suitable for operation in the ambient temperatures typically found for the intended installation.
8 Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
- 9 N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at
10 full input power and across specified voltage range.
- 11 O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- 12 P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and
13 across specified voltage range.
- 14 Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- 15 R. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in
16 the event connections are reversed or shorted during the installation process.
- 17 S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be
18 either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2
19 UL listing.
- 20 T. All luminaires shall be provided with knockouts for conduit connections.
- 21 U. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light engine(s)/board
22 array, and driver(s).
- 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 Y. LED fixtures shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Light Fixture Schedule
38 on the plans without visible flicker or “popcorn effect”. “Popcorn effect” is defined as the fixture
39 being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning the pre-set
40 level when power is returned to the fixture.

41 2.05 EXIT SIGNS

- 42 A. Conform to UL 924.
- 43 1. Sign Colors: Conform to local code.

44 2.06 EMERGENCY LIGHTING UNITS

- 45 A. Conform to UL 924. Provide self-contained units with following features and additional

1 characteristics as indicated.

- 2 1. Battery: Sealed, maintenance-free, lead-acid type with 10-year nominal life minimum, and
3 special project warranty.
- 4 2. Charger: Minimum 2-rate, fully-automatic, solid-state type, with sealed transfer relay.
- 5 3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80% of
6 nominal or below. Lamp automatically disconnects from battery when voltage approaches
7 deep-discharge level. Relay disconnects lamps and battery automatically recharges and floats
8 on trickle charge when normal voltage is restored.
- 9 4. Time-Delay Relay: Provide time-delay relay in emergency lighting unit control circuit
10 arranged to hold unit "on" for fixed interval after restoration of power from an outage.
11 Provide adequate time delay to permit HID lamps to restrike and develop output.
- 12 5. Wire Guard: Where indicated, provide heavy chrome plated wire guard arranged to protect
13 lamp heads or fixtures.

14 2.07 LAMPS

- 15 A. Conform to ANSI C78 series applicable to each type of lamp.

16 2.08 FINISH

- 17 A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks,
18 runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during
19 project warranty period and replace with new fixtures.
- 20 B. Other Parts: Manufacturer's standard finish.
- 21 C. Verify and provide light fixture finishes as selected by ARCHITECT for all light fixture types.
22 Include colored finish selection tables with product submittals. Upon request submit actual material
23 finish swatches for A/E review.

24 PART 3 - EXECUTION

25 3.01 INSTALLATION

- 26 A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure
27 according to manufacturer's printed instructions and approved submittals.
- 28 B. Support For Recessed and Semi recessed Fixtures: Units may be supported from suspended ceiling
29 support system. Install ceiling system support rods or wires at minimum of four rods or wires per
30 fixture located not more than 6 inches from fixture corners.
 - 31 1. Fixtures Smaller Than Ceiling Grid: Install minimum of four rods or wires for each fixture
32 and locate at corner of ceiling grid where fixture is located. Do not support fixtures by
33 ceiling acoustical panels.
 - 34 2. Fixtures of Sizes Less Than Ceiling Grid: Center in acoustical panel. Support fixtures
35 independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 36 3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or
37 near each fixture corners.
- 38 C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit
39 swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers.
40 For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for
41 each unit length of chassis, including one at each end.
- 42 D. Lamping: Lamp units according to manufacturer's instructions.

43 3.02 FIELD QUALITY CONTROL

- 44 A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- 45 B. Give 7-day notice of dates and times for field tests.

- 1 C. Verify normal operation of each fixture after fixtures have been installed and circuits have been
2 energized with normal power source.
- 3 D. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation.
4 1. Duration of supply.
5 2. Low battery voltage shut-down.
6 3. Normal transfer to battery source and retransfer to normal.
7 4. Low supply voltage transfer.
- 8 E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until units
9 operate properly.
- 10 3.03 ADJUSTING AND CLEANING
- 11 A. Clean fixtures upon completion of installation. Use methods and materials recommended by
12 manufacturer.
- 13 B. Adjust aimable fixtures to provide required light intensities.

14 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 scope of this project is as follows:
 - 1. Provide new cables within the Building.
 - 2. 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 for Telecommunications
 - g. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - h. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

- 1 i. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications
2 Cabling Standard
- 3 B. Install cabling in accordance with the most recent edition of BICSI® publications:
- 4 1. BICSI -- Telecommunications Distribution Methods Manual
- 5 2. BICSI -- Cabling Installation Manual
- 6 3. BICSI -- LAN Design Manual
- 7 4. BICSI -- Customer-Owned Outside Plant Design Manual
- 8 C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part
9 of the specifications as if herein repeated or hereto attached. If the contractor should note items in the
10 drawings or the specifications, construction of which would be code violations, promptly call them to
11 the attention of the owner's representative in writing. Where the requirements of other sections of the
12 specifications are more stringent than applicable codes, rules, regulations, and ordinances, the
13 specifications shall apply.

14 1.03 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

- 15 A. As prerequisite to final acceptance, supply to the owner certificates of inspection from an inspection
16 agency acceptable to the owner and approved by local municipality and utility company serving the
17 project.

18 1.04 SYSTEM DESCRIPTION

- 19 A. Telecommunications cabling system generally consists of one telecommunications outlet in each
20 workstation, wall telephones in common and mechanical areas and telecommunications rooms (TRs)
21 located on each floor.
- 22 B. The typical work area consists of a single-gang plate with three standards compliant work area outlets.
- 23 1. Each work area outlet consists of one (1) four-pair data Category 6 cable or above, installed
24 from work area outlet to the TR. Terminate data cables on rack mounted modular patch panels
25 located in the appropriate TR.

26 1.05 SUBMITTALS

- 27 A. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog
28 information), and samples required by the contract documents. Submit shop drawings, product data,
29 and samples with such promptness and in such sequence as to cause no delay in the work or in the
30 activities of separate contractors. The engineer/designer will indicate approval of shop drawings,
31 product data, and samples submitted to the engineer by stamping such submittals "APPROVED" with
32 a stamp. Submitted shop drawings shall be initialed or signed by the contractor, showing the date and
33 the contractor's legitimate firm name.
- 34 1. By submitting shop drawings, product data, and samples, the contractor represents that he or
35 she has carefully reviewed and verified materials, quantities, field measurements, and field
36 construction criteria related thereto. It also represents that the contractor has checked,
37 coordinated, and verified that information contained within shop drawings, product data, and
38 samples conform to the requirements of the work and of the contract documents. The
39 engineer/designer remains responsible for the design concept expressed in the contract
40 documents as defined herein.
- 41 2. The engineer's/designer's approval of shop drawings, product data, and samples submitted by
42 the contractor shall not relieve the contractor of responsibility for deviations from requirements
43 of the contract documents, unless the contractor has specifically informed the
44 engineer/designer in writing of such deviation at time of submittal, and the engineer/designer
45 has given written approval of the specific deviation. The contractor shall continue to be
46 responsible for deviations from requirements of the contract documents not specifically noted
47 by the contractor in writing, and specifically approved by the engineer in writing.
- 48

- 1 3. The engineer's/designer's approval of shop drawings, product data, and samples shall not
2 relieve the contractor of responsibility for errors or omissions in such shop drawings, product
3 data, and samples.
- 4 4. The engineer's/designer's review and approval, or other appropriate action upon shop
5 drawings, product data, and samples, is for the limited purpose of checking for conformance
6 with information given and design concept expressed in the contract documents. The
7 engineer's/designer's review of such submittals is not conducted for the purpose of
8 determining accuracy and completeness of other details such as dimensions and quantities, or
9 for substantiating instructions for installation or performance of equipment or systems, all of
10 which remain the responsibility of the contractor as required by the contract documents. The
11 review shall not constitute approval of safety precautions or of construction means, methods,
12 techniques, sequences, or procedures. The engineer's/designer's approval of a specific item
13 shall not indicate approval of an assembly of which the item is a component.
- 14 B. Perform no portion of the work requiring submittal and review of shop drawings, product data, or
15 samples, until the engineer/designer has approved the respective submittal. Such work shall be in
16 accordance with approved submittals.
- 17 C. Submit shop drawings, product data, and samples as a complete set within thirty (30) days of award of
18 contract.
 - 19 1. For initial submission and for resubmission required for approval, submit four (4) copies of
20 each item. The engineer/designer will only return two copies. Make reproductions as required
21 for your use and distribution to subcontractors.
 - 22 2. Illegible submittals will not be checked by the engineer.
- 23 D. General: Submit the following:
 - 24 1. Bill of materials, noting long lead time items
 - 25 2. Optical loss budget calculations for each optical fiber run
 - 26 3. Project schedule including all major work components that materially affect any other work on
27 the project
- 28 E. Shop drawings: Submit the following:
 - 29 1. Backbone (riser) diagrams.
 - 30 2. System block diagram, indicating interconnection between system components and
31 subsystems.
 - 32 3. Interface requirements, including connector types and pin-outs, to external systems and
33 systems or components not supplied by the contractor.
 - 34 4. Fabrication drawings for custom-built equipment.
- 35 F. Product Data -- Provide catalog cut sheets and information for the following:
 - 36 1. Wire and cable
 - 37 2. Outlets, jacks, faceplates, and connectors
 - 38 3. All metallic and nonmetallic raceways, including surface raceways, outlet boxes, and fittings
 - 39 4. Terminal blocks and patch panels
- 40 G. Project record drawings:
 - 41 1. Submit project record drawings at conclusion of the project and include:
 - 42 a. Approved shop drawings
 - 43 b. Plan drawings indicating locations and identification of work area outlets, nodes,
44 telecommunications rooms (TRs), and backbone (riser) cable runs
 - 45 c. Telecommunications rooms (TRs) and equipment room (ER and/or MC) termination
46 detail sheets.
 - 47 d. Cross-connect schedules including entrance point, main cross-connects, intermediate
48 cross-connects, and horizontal cross-connects.

- 1 e. Labeling and administration documentation.
- 2 f. Warranty documents for equipment.
- 3 g. Copper certification test result printouts and diskettes.
- 4 (a.) Optical fiber power meter/light source test results.

5 1.06 QUALITY ASSURANCE

- 6 A. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this
7 type and size.
- 8 B. Upon request by the engineer/designer, furnish a list of references with specific information regarding
9 type of project and involvement in providing of equipment and systems.
- 10 C. Equipment and materials of the type for which there are independent standard testing requirements,
11 listings, and labels, shall be listed and labeled by the independent testing laboratory.
- 12 D. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA -
13 National Electrical Manufacturers Association), this equipment shall be labeled as certified or
14 complying with standards.
- 15 E. Material and equipment shall be new, and conform to grade, quality, and standards specified.
16 Equipment and materials of the same type shall be a product of the same manufacturer throughout.
- 17 F. Subcontractors shall assume all rights and obligations toward the contractor that the contractor
18 assumes toward the owner and engineer/designer.

19 1.07 WARRANTY

- 20 A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and
21 workmanship for a period of not less than fifteen (15) years from date of acceptance by the owner.
22 The owner shall deem acceptance as beneficial use.
- 23 B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit
24 these warranties on each item in list form with shop drawings. Detail specific parts within equipment
25 that are subject to separate conditional warranty. Warranty proprietary equipment and systems
26 involved in this contract during the guarantee period. Final payment shall not relieve you of these
27 obligations.

28 1.08 DELIVERY, STORAGE, AND HANDLING

- 29 A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and
30 misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not
31 store equipment where conditions fall outside manufacturer's recommendations for environmental
32 conditions. Do not install damaged equipment; remove from site and replace damaged equipment
33 with new equipment.

34 1.09 SEQUENCE AND SCHEDULING

- 35 A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and testing
36 for conformance to specific job completion dates. As a minimum, dates are to be provided for bid
37 award, installation start date, completion of station cabling, completion of riser cabling, completion of
38 testing and labeling, cutover, completion of the final punch list, start of demolition, owner acceptance,
39 and demolition completion.

40 1.10 USE OF THE SITE

- 41 A. The project area will be made available to the Contractor.
- 42 B. Access to building wherein the work is performed shall be as directed by the owner.

43

1 PART 2 - PRODUCTS

2 2.01 MANUFACTURERS

3 A. Hubbell, Ortronics, Panduit

4 1. Or any other approved equivalent manufacturer that meets the performance requirements of
5 this specification. Category 6 performance is standard.

6 2. Contractor shall be a certified installer.

7 B. Berk-Tek

8 C. Belden

9 D. Mohawk

10 E. Commscope

11 F. Superior Essex

12 G. Optical Cable Corporation

13 2.02 FABRICATION

14 A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and
15 functional aspects of equipment and its installation.

16 2.03 SUITABILITY

17 A. Provide products that are suitable for intended use, including, but not limited to environmental,
18 regulatory, and electrical.

19 2.04 STATION CABLE

20 A. VOICE OR DATA TELECOMMUNICATIONS STATION CABLE

21 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four
22 individually twisted-pairs, which meet or exceed the mechanical and transmission performance
23 specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.

24 a. Listed Type CMP (as required in the NEC 2011).

25 2.05 WORK AREA OUTLETS

26 A. VOICE OR DATA WORK AREA OUTLETS (Copper only)

27 1. Single-gang stainless steel mounting plate with four (4) openings containing the following
28 devices:

29 a. Voice Outlet - 8-pin modular, Category 6, unkeyed, white, pinned to T568A standards.

30 b. Two Data Outlets - 8-pin modular, Category 6, unkeyed, blue, pinned to T568A
31 standards.

32 2. The device color of outlets and jacket color for cabling that will be used on the project shall be
33 coordinated with the Dane County Information Technology (IT) Department prior to the
34 beginning of any work. It is intended that the Dane County standard being maintained.

35 B. WALL VOICE OUTLETS

36 1. Single-gang stainless steel faceplate with six-conductor jack and wall telephone mounting lugs

37 C. VOICE OR DATA WORK AREA OUTLET

38 1. Single-gang faceplate with 8-pin modular, category 6, unkeyed, blue data jack, pinned to
39 T568A standards.

40 2. Provide stainless steel cover plates.

1 2.06 PATCH PANELS

- 2 A. 19 in. rack mountable, 24-port 8-pin modular to insulation displacement connector (IDC) meeting
3 Category 6 performance standards and pinned to T568 A standards. Typical examples of IDC
4 connections are the 110, BIX, and Krone.

5 PART 3 - EXECUTION

6 3.01 PRE-INSTALLATION SITE SURVEY

- 7 A. Prior to start of systems installation, meet at the project site with the owner's representative and
8 representatives of trades performing related work to coordinate efforts. Review areas of potential
9 interference and resolve conflicts before proceeding with the work. Facilitation with the General
10 Contractor will be necessary to plan the crucial scheduled completions of the equipment room and
11 telecommunications closets.
- 12 B. Examine areas and conditions under which the system is to be installed. Do not proceed with the
13 work until satisfactory conditions have been achieved.
- 14 C. The contractor shall be responsible for meeting with the Owner's (Dane County) Information
15 Technology staff prior to the start of any installation to coordinate the work to be installed as part of
16 this project. It is the design intent to maintain any cabling or installation standards that are currently
17 in use by Dane County.
- 18 1. Failure to perform this meeting may cause work to be removed and reinstalled if not deemed
19 acceptable by Dane County.

20 3.02 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- 21 A. Be responsible for safekeeping of your own and your subcontractors' property, such as equipment and
22 materials, on the job site. The owner assumes no responsibility for protection of above named
23 property against fire, theft, and environmental conditions.

24 3.03 PROTECTION OF OWNER'S FACILITIES

- 25 A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during
26 construction.
- 27 B. Remove protection at completion of the work.

28 3.04 INSTALLATION

- 29 A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed
30 as part of the contract. Store in areas as directed by the owner's representative. Include delivery,
31 unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required,
32 interconnecting wiring of system components, equipment alignment and adjustment, and other related
33 work whether or not expressly defined herein.
- 34 B. Install materials and equipment in accordance with applicable standards, codes, requirements, and
35 recommendations of national, state, and local authorities having jurisdiction, and National Electrical
36 Code® (NEC) and with manufacturer's printed instructions.
- 37 C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and
38 sidewall pressure when installing cables.
- 39 1. Where manufacturer does not provide bending radii information, minimum-bending radius
40 shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner
41 acceptable to the engineer and the owner.
- 42 D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or
43 galvanized rigid conduit (GRC) sleeves and shall be fire stopped after installation and testing,
44 utilizing a firestopping assembly approved for that application.
- 45 E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.

- 1 F. Installation shall conform to the following basic guidelines:
 - 2 1. Use of approved wire, cable, and wiring devices
 - 3 2. Neat and uncluttered wire termination
- 4 G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches.
5 Support cables installed above removable ceilings.
- 6 H. Install adequate support structures for 10 foot of service slack at each TR.
- 7 I. Support riser cables every three (3) floors and at top of run with cable grips.
 - 8 1. Limit number of four-pair data riser cables per grip to fifty (50)
- 9 J. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the
10 drawings or noted below:
- 11 K. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with
12 power conductors.

13 3.05 GROUNDING

- 14 A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and Bonding
15 Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and
16 manufacturer's grounding requirements as minimum.
- 17 B. Bond and ground equipment racks, housings, messenger cables, and raceways.
- 18 C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground
19 system via #6 AWG green insulated copper grounding conductor.

20 3.06 LABELING

- 21 A. Labeling shall conform to ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
 - 22 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
 - 23 2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in
24 the following locations:
 - 25 a. Inside receptacle box at the work area.
 - 26 b. Behind the communication closet patch panel or punch block.
 - 27 c. Use labels on face of data patch panels. Provide facility assignment records in a
28 protective cover at each telecommunications closet location that is specific to the
29 facilities terminated therein.
 - 30 d. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-
31 606(A) standard color codes for termination blocks.
 - 32 e. Mount termination blocks on color-coded backboards.
 - 33 f. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
 - 34 g. Label cables, outlets, patch panels, and punch blocks with room number in which
35 outlet is located, followed by a single letter suffix to indicate particular outlet within
36 room, i.e., S2107A, S2107B. Indicate riser cables by an R then pair or cable number.
 - 37 h. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn
38 these drawings over to the owner two (2) weeks prior to move in to allow the owner's
39 personnel to connect and test owner-provided equipment in a timely fashion.
 - 40 i. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks
41 of acceptance of project by the owner. A set of as-built drawings shall be provided to
42 the owner in magnetic media form (3.5" floppy disks) and utilizing CAD software that
43 is acceptable to the owner. The magnetic media shall be delivered to the owner within
44 six (6) weeks of acceptance of project by owner.

1 3.07 TESTING

- 2 A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using level
3 IIE or higher field testers.
- 4 B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct
5 grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is caused by
6 improper termination. If termination is proper, tag bad pairs at both ends and note on termination
7 sheets.
- 8 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.1 requirements.

9
10 **Category 6 Test Parameters:**

11

Frequency Mhz	Category 6 Cable Permanent Link Test					
	TIA/EIA 568B.2-1 Insertion Loss Attenuation	TIA/EIA 568B.2-1 NEXT Worst Pair to Pair	TIA/EIA 568B.2-1 PSNEXT Worst Case Loss	TIA/EIA 568B.2-1 ELFEXT Worst Pair to Pair Loss	TIA/EIA 568B.2-1 PSELFEXT Loss	TIA/EIA 568B.2-1 Return Loss
	Max. 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

- 12
- 13 C. Propagation Delay
- 14 1. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2
15 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In
16 determining the permanent link propagation delay, the propagation delay contribution of
17 connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 250MHz).
- 18 D. Delay Skew
- 19 1. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall
20 not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the
21 propagation delay skew between all pairs shall not vary more than +/- 10ns from the measured
22 value at 20 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be
23 determined using a minimum 100m of cable.
- 24 E. In order to establish testing baselines, cable samples of known length and of the cable type and lot
25 installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-
26 pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be
27 calculated based on this test and be utilized during the testing of the installed cable plant. This
28 requirement can be waived if NPV data is available from the cable manufacturer for the exact cable
29 type under test.
- 30 F. In the event results of the tests are not satisfactory, the Contractor shall make adjustments,
31 replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty
32 or defective material, equipment or installation method, and shall make additional tests as the
33 Engineer deems necessary at no additional expense to the project or user agency.
- 34 G. Where any portion of system does not meet the specifications, correct deviation and repeat applicable

1 testing at no additional cost to the owner.

2 3.08 FIELD QUALITY CONTROL

3 A. Installation personnel shall meet manufacturer's training and education requirements for
4 implementation of extended warranty program.

5

6

END OF SECTION 27 10 00

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